Table 5. Elevations (masl) of major maize growing areas in Afghanistan.

S.No.	Province	Lowest	Highest	Average
1	Logar	1875	2250	2062
2	Warkak	2100	2975	2537
3	Kapisa	1950	2600	2275
4	Nangarhar	430	1600	1015
5	Kunar	660	2050	1355
6	Laghman	650	1550	1100
7	Khost	850	1400	1125
8	Kandahar	900	1900	1400
9	Helmand	710	1550	1130
10	Baghlan	550	1600	1075
11	Takhar	400	1800	1100
12	Ghazni	1980	3225	2602

Rice (*Oryza sativa*)

Introduction

Rice is the third most important food crop in Afghanistan. The areas covered under rice is reported to be 210 thousand hectares with the total production of 428 thousand metric tons and an average yield of 2.03 Mt./ha.

Both long grain or fine (Indica type) and short or coarse grain (Japonica type) are grown in Afghanistan in Balkh, Baghlan, Kunduz and Takhar (Northern provinces) and Nangrahar, Laghman and Kunar (Eastern provinces) of Afghanistan. On small scale rice is grown in Herat, Khost and Wardak provinces of Afghanistan.

Afghan local rice varieties especially fine types have good "Pilaf" cooking quality with special aroma which is the most preferred characteristic along with good jumping quality of cooked rice. Unfortunately they are tall, have weak stem and in response to nitrogen lodge severely resulting in lowest yield. Poor cultural practices, pests and diseases are other factors that contribute to low yield of rice in Afghanistan.

Fine grain local rice varieties such as Barah, Lawangai and improved rice varieties such as Saturn, Della and Kolo Australia had been also distributed to farmers by Agricultural Research Institute in North Eastern Afghanistan. In eastern provinces (Nangrahar, Laghman and Kunar) fine grain local varieties (Lawangai, Barah and Pashadai) and improved old varieties such as Saturn, KC-14, KC-15 and CR44-11, old exotic improved coarse grain rice varieties (Tyching Native-1 and Padma) were also distributed. These varieties are used for cooking "Shola" a typical dish of short grain rice in the country.

Focus on new varieties through FAO and international NGOs

FAO, SCA, DAI, MADERA and other NGOs have introduced some rice varieties of both coarse type and fine type to Afghanistan. Seed of the improved varieties was procured and transported by FAO's cross border project and distributed to farmers through NGO's as implementing partners. In the last 5 years a lot of efforts has been put by SCA on rice variety performance and observation trials to identify high yielding, disease resistant, good cooking quality rice for the country. From February 1996 the program of SCA was shifted to FAO under the direct implementation of FAO crops project (UNO/AFG/001/DPS). The variety trials on long and short grain rice has been carried out in Takhar, Balkh and Nangrahar provinces by FAO and in Laghman and Kunar provinces by MADERA as implementing partner of project (UNO/AFG/001/DPS) during 1996 crop growing season. The data collected has been analyzed and the results are discussed.

Materials and Methods

Five national uniform yield trials and one preliminary yield trial on long grain rice, 2 national uniform yield trials, and one preliminary yield trial on short grain rice were conducted in Takhar, Balkh, Nangrahar, Laghman and Kunar provinces. The preliminary yield trials consisted of 20 short grain rice and 30 lines long grain rice varieties that were only conducted in Shishambagh agricultural station of Nangrahar. The rests of the trials consisted of 10 varieties which have been selected based on their performance in 1990-95. The design of the experiments was

randomized block in 4 replications. The plot size was 5 meter long, the number of rows per plot were 6 and the row spacing was 20 cm. The plant to plant spacing was 20 cm. For yield determination, 4 central rows with 4 meters length were harvested. The rate of fertilizer was 120 kg N and 60 kg P2O5 / ha. All phosphate fertilizer and half of nitrogen was applied at transplanting time and the other half of nitrogen was applied 30-35 days after transplanting. The seeding rate was 31.25 kg/ha. and 2 plants / hill were transplanted. All other agronomic practices were applied uniformly. Nurseries were planted in the beginning of May and the seedlings were transplanted from the middle of June to the first week of July to experimental plots on farmers fields. The experiments were harvested between October and November depending on the location and time of transplanting. Yield was recorded in kg/plot and converted in to kg/ha.

In 1997 the project conducted two national yield trials on long grain and two national yield trials on short grain rice in Nangrahar, Takhar, Balkh and Herat provinces. The specifications of the design, rate of fertilizer and seeding rates were the same as in 1996. The results of trials on rice in Herat had too many missing plots due to its very late planting with subsequent late maturity and are therefore discarded.

Results and Discussions (1996) data

Table 1 (Annex 5) shows mean yield kg/ha, days to maturity and rank of ten long grain rice varieties tested by FAO in Takhar Province in 1996. The lines IR 62871-166-2-2, H232-58-2, and the variety Lawangai yielded 7560, 7206 and 6990 kg/ha and ranked 1, 2 and 3 respectively. There are no significant differences in the mean yields of varieties 8, 6, 5, 4 and 3, but varieties 6, 5, and 8 gave 36%, 31% and 27% higher yield than local variety. It is clear that most of these lines have produced yields ranging from 4.4 Mt to 7. 6 Mt. / ha. The experiment was managed very well as shown by the low C.V. (11.84 %).

Table 2 (Annex 5) shows the mean yield kg/ha, days to maturity and rank of long grain rice tested in Sholgar district of Balkh in 1996. The highest yield of 6044 kg/ha was produced by the line RP1670-7613-3-2 while line IR 62871-166-2-2 yielded 5131 kg/ha and ranked 1st and 2nd respectively but, the yield differences between these two lines are statistically not significant. The yields of these lines are significantly higher yield than other varieties. These lines have produced 49% and 27% more yield than the local check.

Table 3 (Annex 5) in Nangrahar provinces showed that the highest yields are recorded for lines CT7616-11-2-2-M-M, IR 62874-73-2-3 and IR 62873-147-4-10 with mean yields of 5032, 4881 and 4752 kg/ha, and ranked 1, 2, and 3 respectively. There are no significant differences between the mean yields of varieties 1,2,7,8, and 9. The yield advantages of these lines over local variety are 21%, 16% and 14% respectively.

Table 4 (Annex 5) shows results of preliminary yield trial on 30 long grain rice varieties tested in Nangrahar province in Shisham Bagh agricultural research station. The highest mean yield is recorded for DR 33 (6958 kg/ha) and ranking of 1, followed by PAK 427-8-14-1 (6515 kg/ha) and ranked 2, and Mansorouar 1372 with the yield of 6481 kg/ha ranked 3. There are no significant differences between the yields of these varieties. Compared to improved local check (Shisham Bagh-72) with the yield of 4186 kg/ha, these lines produced 66%, 55% and 54% more yields.

Wide differences in maturity of long rice varieties were observed in the provinces of Takhar, Balkh, and Nangrahar (Annex 5, Tables 1, 2, 3, 4). Generally there is one month difference in maturity dates between Nangrahar and Balkh provinces and more than one month difference in maturity dates between Nangrahar and Takhar provinces. This means that for example, if we

want to plant Basmati-385 in northern provinces, it should be planted earlier in order to get good yield or we should plant short duration varieties. But for eastern provinces such as Nangrahar, Kunar and Laghman the variety Basmati-385 matures on time and farmers are happy with its yield and cooking quality.

Table 5 (Annex 5) indicates that in Kunar province the highest mean yield of 4843 kg/ha was produced by variety IR 62871-166-2-2 followed by Basmati-385 with the yield of 4833 kg/ha. They have given 3 percent more yield than local variety. However there are no significant differences between the mean yields of the varieties 1, 2, 3, 4, 5, 6, 9 and 10 , They produced significantly higher mean yields than the line 8 (IR 62873-147-4-10). The data of Laghman province also shows that there are no significant differences between the mean yields of entries 1,3,4,6,7,8,9, but the highest mean yield of 5687 kg/ha was obtained from lines (IR 62871-166-2-2). Line (IR62873-244-2-10) with a mean yield of 5479 kg/ha, line (IR 62871-544-3-6) with a mean yield of 5197 kg/ha and variety Basmati-385 with a mean yield of 5187 kg/ha ranked 1, 2, 3 and 4. The local variety produced mean yield of 3771 kg/ha. Compared to local check these lines gave 51%, 45%, 38%, and 37 % more yield per unit area. The combined overall mean yield data and rank of Laghman and Kunar provinces show that lines IR 62871-166-2-2, IR 62873-244-2-10 and variety Basmati-385 are high yielding varieties and produces more than 5 metric tons/ha.

Table 6 (Annex 5) indicates the mean yield kg/ha days to maturity and rank of 10 short grain rice varieties tested in Nangrahar province by FAO in 1996. The highest mean yields were produced by the varieties Vikramarya 1293 (7184 kg/ha), Swat-2 (6676 kg/ha) and Behsudi local (6522 kg/ha) with ranking of 1, 2 and 3 respectively. There are no significant differences between mean yields of varieties 1, 6, 9 and 10. In comparison to local check, the variety Vikramarya 1293 and Swat-2 gave 10% and 2 % higher yield respectively.

Table 7 (Annex 5) indicates the mean yield (kg/ha.), days to maturity and rank of 10 short grain rice varieties tested by FAO in Takhar province in 1996. The variety Swat-2 with a mean yield of 9596 kg/ha., line RP-1670-7613-32 with a mean yield of 8764 kg/ha and variety IR-50 with a mean yield of 7522 kg/ha. ranked 1, 2 and 3 respectively. The local check produced a mean yield of 5903 kg/ha. These lines yielded 62%, 48% and 27% more yields than the local variety. There is no significant difference between variety SWAT-2 and line RP1670-7613-3-2 in this location.

Table 8 (Annex 5) summarizes the data on 20 short grain rice lines in a preliminary yield trial in Nangrahar province carried out by FAO in 1996. The highest mean yield of 7211 kg/ha is given by the variety Vikramarya 1293, followed by the variety CR 1136 with a yield of 6488 kg/ha and variety Sourkh Khosha with a yield of 6413 kg/ha. However, there are no significant differences between the mean yields of these three varieties. Compared to local check they produced 50%, 35% and 33% more yield.

Table 9 (Annex 5) shows that in Laghman province, Swat-2 has given significantly higher mean yield (6819 kg/ha) than other varieties. The average yield differences of Kunhar (5990 kg/ha) and Ravi-1328 (5909 kg/ha) are not significant but, both gave significantly higher mean yields than the rest of the varieties. The mean yield rankings of these lines are 1, 2 and 3 respectively. In comparison to local check (5431 kg/ha) these lines have produced 25%, 10% and 8% more yield respectively.

When the mean yield data of Nangrahar and Laghman provinces was combined (Table 10, Annex 5) the overall mean yield and rank showed that variety Pakal with a mean yield of 7304 kg/ha, Swat-2 with a mean yield of 6748 kg/ha, local check with a mean yield of 5977 kg/ha,

Vikramarya 1293 with a mean yield of 5859 kg/ha, ranked 1,2,3, and 4 respectively. The varieties Pakal, and Swat-2 have produced 22% and 13% more yields than the local check. From the 1996 trials the 20 top yielding lines have been selected for testing in 1997 yield trial in rice growing areas of Afghanistan.

The mean yield data of the long grain rice over 5 locations is presented in Table 11 (Annex 5). The overall mean yield and rank indicates that line IR62871-166-2-2 produced a mean yield of 5496 kg/ha, line H232-58-2 yielded of 5422 kg/ha, CT7616-11-2-2-M-M (5373 kg/ha) and Basmati-385 produced 5145 kg/ha. The yield ranking of lines are 1, 2, 3, and 4 respectively. The local check with a mean yield of 4428 kg/ha ranked 9. In comparison to the local check these lines have produced 24%, 22%, 21% and 16% more yields. From the 1996 long grain rice trials, 25 top yielding varieties have been chosen for further screening in 1997.

Results and Discussion (1997) data

Table 12 (Annex 5) shows the mean yield in kg/ha, overall mean yield and rank of 10 short grain rice variety trial (97NRYTS1) tested in Nangrahar, Takhar and Balkh provinces of Afghanistan. In Nangrahar province, there are no significant differences between the mean yields of the varieties Vikramarya 1293, Mansorouar 1337, Tayching Native-1, Swat-2 and local check but, Vikramarya 1293 with mean yield of 6795 kg/ha ranked first. The variety Mansorouar 1337 with the mean yield of 6589 kg/ha and the local check with the mean yield of 6574 kg/ha ranked 2 and 3 respectively.

In Takhar province there are no significant differences between the mean yields of varieties 1,3 and 4. The variety Swat-2 with the mean yield of 9123 kg/ha, the variety IR50 with the mean yield of 8572 kg/ha, and line H232-58-2 with the mean yield of 8218 kg/ha ranked 1, 2, and 3 respectively. Compared to local (7374 kg/ha) these varieties have given 24%, 16% and 11% more yield.

In Balkh province the highest mean yield was produced by the variety Swat-2 (7751 kg/ha), followed by variety DR83 (7703 kg/ha), IR50 (6010 kg/ha) and ranked 1,2 and 3 respectively. There are no significant differences between their mean yields. Compared to local check (5669 kg/ha), these varieties have produced 37%, 36% and 6% more yield.

The overall mean yield and rank over 3 locations indicated that the variety Swat-2 with a mean yield of 7637 kg/ha, DR 83 with a mean yield of 6827 kg/ha ranked 1 and 2. Swat-2 is top yielding in both locations. The varieties Vikramarya 1293, Tayching Native-1 are not adapted to the agroclimatic conditions of the north and north east and have produced the lowest yieldeds in Takhar and Balkh provinces.

The results of mean yield, overall mean yield and rank of 10 varieties of short grain rice trial (97 NRYTS2) from Nangrahar, Takhar and Balkh provinces are summarized in Table 13 (Annex 5). It shows that in Nangrahar province, there are no significant differences between the mean yields of the entries 1, 2, 3, 4, 7, 9 and 10. The highest mean yield is produced by local check (6895 kg/ha), followed by Sourkh Khosha (6711 kg/ha), IR 504040-8-1-1-3 (6616 kg/ha) and ranked 1,2,3 respectively.

In Takhar province there are no significant differences between the mean yields of Pak-1379 (8342 kg/ha) and KC15 (8338 kg/ha). The yield of these varieties ranked 1 and 2 respectively (Table 13, Annex 5). These lines have produced 19% higher yield than local check (7024 kg/ha)

In Balkh province these two lines Pak1379 (7873 kg/ha) and KC15 (7483 kg/ha) are also high yielding. There is no significant difference between their mean yields but both are significantly higher than other lines. Compared to local check (5148 kg/ha) these lines have produced 53% and 45% more yields (Table 13, Annex 5).

The overall mean yield and rank of these lines over three locations shows that the variety Pak1379 with an overall mean yield of 7028 kg/ha, KC15 with an overall mean yield of 6856 kg/ha have ranked 1 and 2nd. The local variety in both locations also produced high yields. However, the variety Pak1379 has produced 11% and variety KC15 has produced 8% more yield than the local check. These lines have exhibited good adaptation to northern climatic conditions.

The mean yields, overall mean yields and rank of 15 long grain rice varieties tested in in (97NRYTL1) trial in Nangrahar, Balkh and Takhar provinces of Afghanistan are summarized in Table 14 (Annex 5). The data shows that in Nangrahar province the highest mean yield was produced by RP1670-7613-3-2 with a mean yield of 5033 kg/ha followed by IR62873-147-4-10, and IR62871-166-2-2 with a mean yield of 4129 kg/ha and 4109 kg/ha and have ranked 1, 2, 3, respectively. However there are no significant differences between their mean yields. All three produced significant higher yields than other lines.

In Balkh province the highest mean yield was produced by the variety Sarda Barah (7836 kg/ha), followed by line RP1670-7613-3-2 (7603 kg/ha). There are no significant differences between the mean yields of these two lines. Both produced significantly higher yields than all other lines.

In Takhar province the highest mean yield of 7434 kg/ha was produced by line RP 1670-7613-3-2 and ranked first. The line IR62871-166-2-2 with a mean yield of 7232 kg/ha ranked second. There are no significant differences between their mean yields. Both lines produced significantly higher yields than all other lines.

The overall mean yield and rank data indicates that line RP1670-7613-3-2 with a mean yield of 6690 kg/ha, Sarda Barah with a mean yield of 5624 kg/ha and IR62871-166-2-2 with a mean yield of 5491 kg/ha ranked 1,2 and 3 respectively.

The mean yield, combined mean yield (kg/ha) and rank data of 10 long grain rice varieties trial (97NRYTL2) conducted in Nangrahar, Takhar and Balkh provinces of Afghanistan are summarized in Table 15 (Annex 5). It shows that in Nangrahar the highest mean yield was given by the variety Pak 427-8-14-1 (6592 kg/ha) and ranked first. Basmati-385 with the mean yield of 6542 kg/ha and Pak1379-9-11 with a mean yield of 6227 kg/ha, KC1344 with a mean yield of 5805 kg/ha have ranked 2, 3 and 4 respectively. There are no significant differences between their yields however, all four varieties have produced significantly higher yields than other lines tested.

In Takhar province the highest mean yield has been produced by the variety DR33 (6936 kg/ha) and ranked first. Saybare 1289 with a mean yield of 6707 kg/ha and IR5287-15-2-12 with a mean yield of 6594 kg/ha ranked 2nd and 3rd respectively. There are no significant differences between their mean yields. All three lines have produced significantly higher mean yield than other lines (Table 15, Annex 5).

In Balkh province the highest yielding variety was Saybare 1289 with a mean yield of 10125 kg/ha, followed by KC1344 (9141 kg/ha) and line IR5287-1502-1-2 (8138 kg/ha). These lines ranked 1,2 and 3rd respectively (Table 15, Annex 5).

The combined mean yields and ranking data of these lines over 3 locations indicates that Saybare 1289 is the highest yielding lines (7242 kg/ha) followed by lines KC1344 (6853 kg/ha), IR5287-

15-2-1-2 (6761/kg/ha) and DR 33 (6220 kg/ha). These are the highest yielding rice lines and ranked 1,2,3 and 4th respectively (Table 15, Annex 5).

To conclude and give recommendations about both long and short grain rice varieties suitable to the agro-climatic condition of Afghanistan, data on both types of rice varieties from 1990-1997 in different locations of rice producing areas is combined and summarized in Table 16 (Annex 5) for short grain rice varieties and in Table 17 (Annex 5) for long grain rice varieties. The data of 1991 was excluded because the trials could not be harvested. The mean yield (kg/ha) of short grain rice varieties is grouped according to the number locations and years Table 16 (Annex 5). Data from 5-25 locations and 3-7 years is grouped under rank A. The varieties and lines that have been tested in 1-7 locations and 1-2 years are grouped under rank B. In group A, Swat-2 (7306 kg/ha), IR50 (6412 kg/ha). Pakal (6280 kg/ha), DR83 (6096 kg/ha) and RP-1760-7613-3-2 (6054 kg/ha) are the highest yielding rice varieties and ranked 1, 2, 3, 4, and 5 respectively. The local check had an overall mean yield of 5603 kg/ha and ranked 7. In comparison with the local variety, these varieties have produced 30%, 14%, 12%, 9% and 8% higher yields.

The top yielding varieties of rank A and rank B such as Swat-2, RP1670-7613-3-2, DR83, IR50, UTI, Arongana 688, PAK379, KC15, H232-58-2, SPTLR 81388, Sonasati, and BG1230 were placed in national short grain rice yield trial for 1998 in Herat, Nangrahar, Takhar and Balkh provinces of Afghanistan.

The yearly mean yield (kg/ha), numbers of locations, overall mean yield and ranks of long grain rice varieties tested in Afghanistan during 1990-97 is summarized in Table 17 (Annex 5). The lines that have been tested for 3-6 years in 6-20 locations are grouped in rank A. Those lines that were tested for two years in 3-6 locations are grouped in rank B. In group A lines, the highest overall mean yield was produced by PR1670-7613-3-2 with a mean yield of 6776 kg/ha and ranked 1st. Line (IR62871-166-2-2) produced a mean yield of 5865 kg/ha. Line (IR 62871-544-3-6) yielded 5609 kg/ha followed by IR62873-147-4-10 (5418 kg/ha), IR62874-73-2-3 (5366 kg/ha) and variety Basmati-385 (the current improved rice variety) with a mean yield of 5271 kg/ha. These lines ranked 2, 3, 4, 5, and 6 respectively. The local variety (line 3) produced the mean yield of 4812 kg/ha and ranked 12th. In comparison to the local variety these lines have produced 41%, 22% 17%, 13%, 12%, and 10% more yield.

In group B (Table 17, Annex 5), the highest overall mean yield of 7081 kg/ha was produced by line 12 (IR3429-47-3-2-2), followed by IR 39357-133-2-2-2 (7079 kg/ha), IR50 (6814 kg/ha), IR31787-41-2-2-3-3 (6734 kg/ha) and IR259958-60-2-3 with an overall mean yield of 6538 kg/ha. Their yield ranking is 1, 2, 3, 4, and 5 respectively. The top ten highest yielding varieties of the both ranks have been selected for further testing in National Long grain rice yield trial for 1998 by FAO in Nangrahar, Takhar, and Balkh and by implementing International NGOs in Khost, Laghman and Kunar provinces of Afghanistan. For Heart province a specific adaptation trial of long grain rice was designed.

Rice Agronomy

In 1996, 4 agronomy trials such as fertilizer trial, date of planting, plant spacing and number of plants/hill were conducted in Takhar province. In the same year in Nangrahar province (Shisham Bagh Agricultural Station) one date of planting and one fertilizer trial was conducted on rice variety Shisam Bagh 72. During 1997 a date of planting trial was conducted in Takhar and Nangrahar provinces. In Nangrahar province a rate of fertilizer trial was also implemented.

Materials and Methods

In 1996 in Takhar province a date of planting trial on rice line RP1670-7613-3-2 was conducted to find the optimum date of planting for rice in the province. Planting of nursery started from 25 April and ended on 15 May with 5 days interval between dates. The transplanting date started from June 5 to June 25 and was spaced at 5 days interval as well. The design of the experiment was randomized complete block (RCBD) with 4 replications. There were 6 rows in each plot, the row length was 4 m and the row to row and plant to plant spacing was 20 cm. The planted area was 4.8 m^2 and the harvested area was 3.2 m^2. The rate of fertilizer was 120 kg of nitrogen and 60 kg P_2O_5 per hectare.

A rate of fertilizer trial on rice line RP1670-7613-3-2 was also conducted in Takhar province in 1997. The treatments consisted of 3 rates of nitrogen (0-70-140 kg/ha) and 3 rates of P_2O_5 (0-57-115 kg/ ha). The design, number of replications, number of rows, row length, row spacing, planted and harvested area was the same as in the date of sowing trial.

One plant population trial (plant to plant spacing within a row) in RCBD with 4 replications was also carried on rice line RP1670-7613-3-2. The row to row spacing was 20 cm. The plant to plant distances were 10, 15, 20, 25 and 30 cm. Each plot consisted of 4 rows 4 meters long. The two central rows, 3 meters long were harvested for yield purposes. The rate of fertilizer used was 120 kg nitrogen and 60 kg P_2O_5 /ha.

A fourth trial in Takhar province was also plant population but it was based on number of plants / hill on rice line RP1670-7613-3-2. The design of the experiment was RCBD with 4 replications and 5 treatments (2, 4, 6, 8 and 10 plants/hill) in each replication. There were 4 rows, 4 meter long. The row to row and plant to plant spacing was 20 cm. The fertilizer rate was the same as spacing trial.

In 1996 in Nangrahar province (Shisham Bagh Agricultural Station) one date of planting and one fertilizer trial was conducted on rice variety Shisam Bagh 72. Five sowing dates in RCBD with 4 replications were planted. The area planted was 7.5 m^2 and the area harvested was 4 m^2. Nitrogen and P_2O_5 fertilizers were applied at the rates of 120 and 60 kg/ha respectively. The first date of planting was on 5 June 1996 and the last date was on 7 July 1996.

The design of the fertilizer trial was (RCBD) with 9 treatment combinations on rice variety Shisham Bagh 72. The plot areas planted and harvested were the same as date of planting trial. It was transplanted on 1 July 1996 and harvested on 5 November 1996.

In 1997 there were two dates of planting trials on rice line RP1670-7613-3-2, one in Takhar and one in Nangrahar provinces. In Takhar province the of planting of nursery started on 24 April 1997 and ended on 25 May 1997 in 7 dates. The transplanting started from 5 June 1997 and ended on 5 July 1997 at five days interval. The planted area was 4.8 m^2 and the harvested area was 2.72 m^2. The design of the trial was RCBD with 4 replications.

In Nangrahar province a sowing date trial was conducted in Shisham Bagh research station on RP1670-7613-3-2 in RCBD with 4 replications. There were 5 dates of planting in the nursery from 15 April 1997 to 5 May 1997 at five days interval. The transplanting of experiment started on 15 June 1997 and ended on 5 July 1997 at five days interval. The planted area was 7.5 m^2 and the harvested area was 3.2 m^2.

The fertilizer trial in Nangrahar was on rice variety Shisham Bagh 72. It was planted on 2 July 1997 and harvested on 5 November 1997. The design, number of replications, numbers of rows, row length, row spacing, planted and harvested areas were the same as the fertilizer trial in 1996.

Results and Discussion

The results of the spacing trial between plants are presented in the Table 18 (Annex 5). The data revealed that there are no significant differences in the mean yields of plant to plant spacing of 10, 15, 20, 25, and 30 cm. However, the highest yield was recorded for 30 cm spacing between plants. It has produced 1.5%, 5%, 8% and 14% more yields than 25, 20, 15, and 10 cm spacing respectively. In 1000 kernel weight trait, the highest 1000 kernel weight was observed for the 30 cm spacing. It is significantly higher than all other treatments. It has produced 5% more weight than the spacing 10 cm, 15 cm, and 20 cm, and 8 % more 1000 kernel weight than the 25 cm spacing. For the number of panicles per hill, significant differences between treatment were observed. The highest number of panicles per hill were produced by the 30 cm and 25 cm spacing. As the spacing increased the number of panicles per hill increased (Table 18, Annex 5).

Table 19 (Annex 5) shows the mean panicles per hill, number of kernels per panicle, yield kg/ha in the number of plants per hill experiment in Takhar province. The highest number of panicles per hill (9.23) was produced in the treatment (2 plants per hill) which is significantly higher than other treatments followed by 4 plants per hill which is also significantly higher than 6, 8 and 10 plants / hill. There are no significant differences between the number of panicles /hill between 6 and 8 plants /hill. They produced 3.82 and 3.21 panicles / hill respectively. However, six plants / hill produced significantly more mean panicles / hill than ten plants / hill. As the number of plants / hill increased the number of panicles / hill decreased significantly (Table 19, Annex 5). The same trend is followed in the number of kernels per panicle trait.

The number of plants / hill treatment shows that 8 plants / hill produced the highest yield (9899 kg /ha). There are no significant differences in yields of 4, 6, and 10 plants / hill. These treatments produced significantly higher yields than the 2 plants / hill treatment.

The date of planting experiments in two years (1996 and 1997) in Takhar province on rice line (RP1670-7613-3-2) is summarized in Table 20 (Annex 5). In 1996, no significant differences were observed between mean yields of these five sowing dates. However, the highest mean yields of (7665 kg/ha) were recorded in June 10 planting followed by June 20 (7616 kg/ha) and June 5 sowing (7518 kg/ha).

In 1997, the date of planting data showed that the highest mean yield was again recorded for the June 10 sowing (9806 kg/ha) but, it is not significantly different from the June 5 sowing (9703 kg /ha). The mean yields of rice in these two dates are higher than the other dates (Table 20, Annex 5). The lowest mean yield of 4805 kg/ha was recorded for the 5 July sowing. A decline in yield ranging from 500 kg/ha to 1377 kg/ha has been observed when rice is transplanted after June 10 at five days interval. This is an unnecessary yield loss of more than 100 kg/ha per day which can easily be avoided if this message is conveyed to the farmers through extension services. This data shows that the first three weeks of June is an appropriate time of rice transplanting in Takhar province.

The date of planting trial in Nangrahar province for 1996 and 1997 is summarized Table 21 (Annex 5). In 1996, the June 30 planting gave the highest yield (6355 kg/ha) which is not significantly different than the June 20, June 25, and July 5 sowing but, significantly higher than the June 15 planting (4428 kg/ha). Similarly trend is noticed in yields of this trial in 1997, but the lowest yield of (4806 kg/ha) was recorded for July 5 planting. It shows that in Nangrahar the optimum time of rice transplanting is between June 20 and June 30.

The response of a medium grain rice the line RP1670-7613-3-2 to different rates of nitrogen and phosphate fertilizer in Takhar and Nangrahar provinces is summarized in Table 22 (Annex 5) for

1996 and 1997. In Takhar province in 1996 the highest yield (8741 kg/ha) was recorded for treatment number 6 (69 kg N and 115 kg P_2O_5 /ha). This is not significantly different from the response to treatment 3 (8373 kg/ha), treatment 5 (8051 kg/ha) and treatment 9 (8704 kg/ha), which ranked 1, 2, 3 and 4 respectively. The treatment 1 (0 kg N and 0 kg P_2O_5 /ha) has produced the lowest yield of 6374 kg/ha. All treatments with only N or P or their respective combinations yielded more than the control plots.

In Nangrahar province in 1996 the highest mean yield (6329 kg/ha) was given by treatment 9 (138 kg N and 115 kg P_2O_5 /ha). This response is not significantly different from the response to treatments 4, 5, 6, 7 and 8. These treatments produced significantly higher yields than the treatments 1, 2, and 3, where no fertilizer was applied or only phosphate fertilizer was applied. In 1997, in Nangrahar province the highest yield was recorded for treatment 4 (69 kg N). This response is not significantly different from the response to treatments 5, 6, 7, 8, and 9. These treatments gave significantly higher yields than treatments 1, 2, and 3 where no fertilizer or only phosphate fertilizer was applied.

Summary

Since data on date of planting, fertilizer, number of seedlings / hill and plant population is for one year only, it is not enough to recommend agronomic package to the farmers. It is suggested to continue these experiments for two more years with improvement in the implementation of the experimental controls, specifically the rates of fertilizers. However, we can summarize the results as follows:

1. In the plant density experiment (number plants /hill), the 4-10 plants /hill produced higher yield than 2 plants / hill, therefore 4 plants / hill is suggested to farmers.
2. The date of transplanting experiment on rice in Takhar province showed that the 5 to 20 June planting produced higher yields, more tillers / plant and taller plants than the 30 June and 5 July planting. The crop matured earlier and therefore the farmers will have more time for land preparation for wheat crop. In Nangrahar province transplanting of rice from 20 to 30 June produced the highest yields.
3. In row spacing trial 25-30 cm distance between plants has given more yield and panicles / hill with significant yield differences.
4. Although N fertilizer application has shown more effect on increasing yield of rice than phosphate fertilizer, the farmers should not use nitrogen or phosphorous alone. The highest yield was recorded when high rates of fertilizer (138 kg N and 115 kg P_2O_5 /ha) was applied. If farmers can not afford to buy the fertilizer or if fertilizer is scarce, than the low doses of (69 kg N and 57 kg P_2O_5 /ha) will also give satisfactory yield and good economic return.

Conclusion and Recommendations

Based on the combined data of years and locations, the following conclusions and recommendations are drawn:

1. Swat-2 is a top yielding short grain rice variety. It has yielded more than 7 Mt./ha over 7 years in 23 locations. It has a wide range of adaptability. The seed of this variety should be multiplied and distributed in rice growing areas.
2. Varieties DR 83, IR50, Arongana 688, Pak1379, KC15, H232-58-2 and UTI should be tested in future variety testing program. These are also potentially good yielding lines.

CIMMYT scientists also confirmed that Pirsabak-85 and Pak-81 wheat varieties which have formed the back-bone of wheat production in Afghanistan have become susceptible to new races of stripe rusts and should be replaced.

It is therefore, necessary to identify, test and increase seed of wheat varieties with diverse origin to broaden and diversify the genetic base of wheat genotypes in use in the country. As with other crops early generation seed are required to accelerate the maintenance, production, and security of these scarce resources of seed in Afghanistan. In light of this, SIDA (Swedish International Development Agency) funded the UNO/AFG/001/DPS project with FAO for crop improvement activities in Afghanistan in 1996. Prior to this the crop improvement activities were previously carried by SCA in three zones in Afghanistan (North East, East Central and Eastern) with logistic support from it head office in Peshawar and the FAO cross border project in Islamabad. Beginning 1996, these activities were directly managed by FAO and expanded to six agro-ecological zones (East, East Central, South West, North West, North and North East). A large number of wheat lines of diverse genetic background were evaluated for adaptation and yield in these zones.

2.1. Materials and Methods

FAO crop improvement has been receiving international wheat yield trials, observation and screening nurseries for favorable and semi arid conditions from CIMMYT and ICARDA for testing in Afghanistan. In addition to these, yield trials were prepared from previous selected top yielding wheat lines that were tested by SCA in Afghanistan. The experimental material was sent to Balkh, Takhar, Baghlan, Nangrahar, Ghazni, Logar, Gardez and Khost provinces to be tested under a wide range of agro-climatic conditions. In 1995-1996 crop season 105 multilocation yield trials and observation nurseries of wheat were planted in northern, north eastern, east central, south western, and eastern zones of Afghanistan under irrigated and rainfed conditions.

The design of the experiments was randomized complete block (RCBD) with four replications. The plot size was 6 rows 4 meters long with 25 cm distance between rows. Four central rows with a length of 3 meters were harvested for yield. Half meter from both ends of the plot were not included in the harvest in order to minimize border effect on the yield. Seed rate was 100 kg/ha, the fertilizer rate was 100 kg /ha of nitrogen and 60 kg/ha of P_20_5 . Potassium fertilizer has not been used. All other activities such irrigation, weeding, rouging, and pest control have been uniformly applied to each experiment. The yield was recorded in gram per plot and converted to kg/ha.

2.2. Results and Discussion

The data of each experiment was analyzed separately for 1995-96 and 1996-97 using MSTAT, statistical package. A combined analysis of variance was performed on yield data after the homogeneity of variance tests for each experiment. Highly significant differences were observed among genotypes for yield (kg/ha) in both individual site and combined analyses of variances. Highly significant differences between locations and genotype by location interactions were observed which is indicative of the differential response of each lines to the agro-climatic conditions of each site. The project is emphasizing on recommending widely adapted new wheat varieties. Therefore selection were made based on the overall yield performance, wide adaptations, disease resistance, drought tolerance and

3. RP1670-7613-3-2 a medium grain size rice and IR62871-166-2-2 a long grain rice lines are the top yielding lines which produced 1.5 Mt. / ha, and 0.59 Mt./ha more yields than Basmati-385, the current long grain improved rice variety. These lines are high yielding , widely adapted and should be recommended for release and increase.
4. IR62871-544-3-6 and IR62873-147-4-10 are other top yielding lines and should be included in future variety tests for identifying high yielding rice lines for rice growing areas.
5. Afghan local germplasm has good cooking quality, it should be collected, evaluated, preserved and utilized in future rice improvement program.
6. In order to submit a package of improved agro-techniques along with the introduction of new rice varieties, it is important to conduct fertilizer, date of planting and plant population trials in rice growing zones of Afghanistan.

Information on Selected Rice Varieties

1. **RP1670-7613-3-2:** It is a medium grain rice line from IRRI that can be used for both "pilaf" and "shola" cooking. It was tested in 1994 and 1995 in preliminary yield trials in long grain rice in Baghlan province. In 1996, it was tested in national short grain rice yield trial in Nangrahar, Laghman, Kunar, Balkh, and Takhar provinces of Afghanistan. In 1997 it was tested in both long and short grain rice national yield trials in Nangrahar, Takhar, and Balkh provinces. The overall mean yield of RP1670-7613-3-2 in short grain rice tested in 8 locations was 6054 kg/ha and ranked 5th, but because of its good quality and high price in market it can compete with Swat-2, a high yielding short grain rice. Farmers in Baghlan, Kunduz and Taloqan are interested in this rice line. In 1997, the crop improvement project has distributed 5.5 Mt. seed of this line to farmers in Baghlan, Kunduz and Takhar provinces.

   In the long grain rice variety yield trials, conducted from 1994 to 1997, the line RP1670-7613-3-2 is top yielding and has produced an overall mean yield of 6776 kg/ha with a ranking of 1. It has produced 1.5 Mt./ha more grain yield than Basmati-385 (the current long grain) rice variety in Afghanistan. It has an average height of 82 cm and matures 5-10 days earlier than Swat-2 and one week earlier than Basmati-385. It is 5-10 cm shorter than Basmsti-385.

2. **Swat-2:** It is a short grain rice variety. It was tested in short grain rice yield trials from 1990 to 1995 by SCA (Swedish Committee for Afghanistan). In 1996 and 1997 it was tested by FAO in different zones of Afghanistan. It is widely adapted and is top yielding in multilocation tests every year (7309 kg /ha). It matures in 147 days and has an average height is 103 cm. It is resistant to lodging. It matures earlier than the local varieties in Nangrahar and in Takhar provinces.

3. **IR62871-166-2-2:** It is a long grain rice line selected from IRRI international yield trial. It has been tested since 1993 in long rice yield trials in Nangrahar, Laghman and Kunar provinces. It was also tested in 1994 and 1995 in long grain rice yield trial in Baghlan, Nangrahar, and Kunar provinces by SCA. In 1996 it was tested by FAO in the long grain rice yield trials in Takhar, Balkh, Nangrahar, Laghman and Kunar provinces of Afghanistan. In 1997 it was tested in national long rice yield trials in Nangrahar, Balkh, and Takhar provinces. It is a bout 5-10 cm shorter than Basmati-385 (the current improved long grain) rice and 3-5 days earlier than Basmati-385. The overall mean yield

of IR62871-166-2-2 from 1993-1997 in 17 locations is 5865 kg /ha and has out yielded Basmati-385 by over 0.5 Mt./ha.

Annex 5
Rice data 1991-1997
(Tables 1-22)

Table 1. Mean yield (kg/ha), days to maturity (DTM) and rank of 10 long grain rice lines tested in Takhar province by FAO in 1996.

No.	Name or pedigree	DTM	Yield	Rank
1	IR 62874-73-2-3	108	4444	10
2	CT 7616-11-2-2-M-M	108	6385	6
3	IR 62873-417-4-1	129	6770	5
4	IR 62871-544-3-6	139	6965	4
5	H 232-58-2	130	7206	2
6	IR 62871-166-2-2	118	7560	1
7	IR 62873-244-2-10	130	5425	9
8	Lawangai	130	6990	3
9	Basmati-385	124	6153	7
10	Local check	126	5492	8
	LSD at P= .05		1089	
	CV %		11.84	
	Grand mean		6339	

Table 2. Mean yield (kg/ha), days to maturity (DTM) and rank of 10 long grain rice lines tested in Balkh province by FAO in 1996.

No.	Name or pedigree	DTM	Yield	Rank
1	IR 62874-73-2-3	136	4323	4
2	CT 7616-11-2-2-M-M	125	3710	8
3	IR 62873-417-4-1	137	3688	9
4	IR 62871-544-3-6	133	4036	7
5	H 232-58-2	143	4227	5
6	IR 62871-166-2-2	146	5131	2
7	IR 62873-244-2-10	146	3225	10
8	IR 62873-147-4-10	131	4939	3
9	RP 1670-7613-32	133	6044	1
10	Local check (Bara)	139	4039	6
	LSD at P= .05		939	
	CV %		14.93	
	Grand mean		4335	

Table 3. Mean yield (kg/ha), days to maturity (DTM) and rank of 10 long grain rice lines tested in Nangrahar province by FAO in 1996.

No.	Name or pedigree	DTM	Yield	Rank
1	IR 62874-73-2-3	160	4881	2
2	CT 7616-11-2-2-M-M	156	5032	1
3	IR 62873-417-4-1	162	3877	10
4	IR 62871-544-3-6	160	4344	6
5	H 232-58-2	154	3897	9
6	IR 62871-166-2-2	161	4261	7
7	IR 62873-244-2-10	160	4388	5
8	IR 62873-147-4-10	156	4752	3
9	Basmati-385	160	4405	4
10	Local check (Sheshambagh-72)	162	4149	8
	LSD at P= .05		661	
	CV %		10.37	
	Grand mean		4398	

Table 4. Mean yield (kg/ha), days to maturity (DTM) and rank of 30 long grain rice lines tested in Nangrahar, Afghanistan by FAO in 1996.

No.	Name or pedigree	DTM	Yield	Rank
1	IR 41996-118-2-3	155	4949	22
2	IR 963-8-1-1-3	159	6297	5
3	PAK-1379-9-1-1	160	6265	6
4	IR 50404-57-1-1	165	5350	16
5	DR 29	165	7438	24
6	Mansorourar 1337	164	6481	3
7	PAK 1527-14-1-1-3	160	5193	20
8	Saybare 1289	166	5820	11
9	DR 33	162	6958	1
10	IR 5287-15-2-3-6	167	5458	15
11	DR 31	159	4883	23
12	IR 5912-9-1-1-3-3	165	5269	19
13	PAK 427-8-14-1	160	6515	2
14	Basmati-385	165	6126	7
15	Sheshambagh-72	160	4186	28
16	DR 32	156	5872	10
17	PAK 1501-9-2-3-1	162	3401	9
18	KC 1344	161	5953	25
19	Pusa Basmati 1253	164	4707	29
20	PAK 1335-4-1-1-3-4	177	2590	30
21	DM 24	165	5780	12
22	DR 28	156	5873	17
23	IR-5287-15-2-1-2	162	5984	8
24	DM 25	162	5320	18
25	Parsiana 1311	163	5422	4
26	KC 15	162	6458	14
27	PAK25924-51-2-7-1	161	5569	13
28	TR-28128-45-2-1	154	5135	21
29	H232-58-2	157	4838	24
30	IR62873-147-4-10	157	4648	26
	LSD at P= .05		1032	
	CV %		11.73	
	Grand mean		5384	

Table 5. Mean yield (kg/ha) and rank of 10 long grain rice lines tested in Kunar and Laghman provinces of Afghanistan by MADERA as implementing partner of UNO/AFG/001/DPS during 1996.

No.	Name or pedigree	Kunar		Laghman		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank
1	IR 62874-73-2-3	4510	5	5109	6	4809	5
2	CT 7616-11-2-2-M-M	4145	6	3993	8	4069	9
3	IR 62873-417-4-1	4010	7	5026	7	4518	6
4	IR 62871-544-3-6	4645	4	5197	3	4921	4
5	H232-58-2	3854	8	3963	9	3908	10
6	IR 62871-166-2-2	4843	1	5687	1	5265	1
7	IR 62873-244-2-10	4583	9	5479	2	5031	2
8	IR 62873-147-4-10	3052	10	5183	5	4117	8
9	Basmati-385	4833	2	5187	4	5010	3
10	Local check	4687	3	3771	10	4229	7
	LSD at P= .05	1218		1366			
	CV %	19.46		16.39			
	Grand mean	4317		4860			

Table 6. Mean yield (kg/ha), day to maturity (DTM) and rank of 10 short grain rice tested by FAO in Nangrahar in 1996

No.	Name or pedigree	DTM	Yield	Rank
1	Swat-2	165	6676	2
2	Kunhar	153	2941	9
3	DR83	160	5623	7
4	Pakal	160	4914	8
5	RP 1670-7613-3-2	162	5730	6
6	Vikramarya-1293	162	7184	1
7	Mansorouar-1337	155	5739	5
8	Ravi-1328		940	10
9	Tiaching Native-1	162	6522	3
10	Local (Behsudai)	162	6466	4
	LSD at P= .05		458	
	CV %		5.3	
	Grand mean		5965	

Table 7. Mean yield (kg/ha), days to maturity and rank of 20 short grain rice lines tested in preliminary yield trial in Nangrahar, Afghanistan during 1996 by FAO.

No.	Name or pedigree	DTM	Yield	Rank
1	Swat-2	130	9596	1
2	Aronga 688	138	6917	6
3	HSA 264 M	113	4534	10
4	H232-58-2	123	7091	4
5	RP 1670-7613-3-2	126	8764	2
6	IR 50	128	7522	3
7	CT 746-11-20-M-M	118	6275	7
8	Sorkhai- Baghlan	128	5903	8
9	Panda	118	5389	9
10	Sptlr 81388	144	7051	5
	LSD at P= 0.05		1404	
	C.V. %		13.99	
	Grand Mean		6904	

winter hardiness at several locations in Afghanistan. The selected lines were placed in yield trials in 6-8 locations for further evaluation in 1996-1997 crop season. As a result of this applied research a number of lines that have performed well over years and locations have been identified and selected as possible candidates for improved wheat variety release program. The response and severity of reaction of these lines to the three rust diseases (stripe, stem and leaf) are rated from TR to MR using the modified Cobe scale. Breeder seed of these new lines is under multiplication through FAO seed component for distribution to farmers in different locations in Afghanistan.

The adaptability of these lines has been confirmed from the data of 1991-1997 with a mean yield range of 4.82-6.28 Mt./ha (Table 27, Annex 2). The data on mean yield of these lines in national wheat yield trials and preliminary wheat yield trials in different agro-climatic zones of Afghanistan for 1995-96 is presented in tables 1-25 (Annex 1). Similarly summary tables of mean yield kg/ha of each experiment for 1996-97 crop season are presented in Annex 2 (Tables 1-30). The summary information presented here is for the selected genotypes that are high yielding, disease resistant and adapted to wide range of agro-climatic conditions in Afghanistan.

Breeder seed of these varieties and other promising lines is available with crop improvement project (UNO/AFG/001/DPS) in four locations and their increase is initiated in six location in country. Similarly two promising wheat lines for rainfed conditions have been identified and their seed has been increased in 1996-97 crop season. The summary of results of these lines is presented in Table 6.

Table 8. Mean yield (kg/ha), days to maturity and rank of 20 short grain rice lines tested in preliminary yield trial in Nangrahar, Afghanistan during 1996 by FAO.

No.	Name or pedigree	DTM	Yield	Rank
1	Vikramarya 1293	165	7211	1
2	Ravi-1328	155	5396	13
3	Sourkh Khosha	165	6413	3
4	IR 504040-8-1-1-3	165	6340	4
5	IR 1451-1196-1562-427	155	5751	12
6	Pak13896-9-1-13-4	162	5353	14
7	Sonasati	162	6307	5
8	BG1230	155	5947	11
9	Tiaching Native-1	164	6090	8
10	Rasi 1325	154	5113	17
11	Tulasi	158	5141	15
12	DR30	156	5028	18
13	Behsudai Local	157	4797	20
14	Aditaya	158	4803	19
15	Pak1379	160	6064	9
16	CR 1136	162	6488	2
17	IR41993-31-2-2-3	160	6169	7
18	IR 50	155	6300	6
19	RP1857-37-93-1	158	5116	16
20	KC15	155	6037	10
	LSD at P= 0.05		899	
	CV %		10.97	
	Grand mean		5793	

Table 9. Mean yield (kg/ha) and rank of 10 short grain rice lines tested in Mehtherlam district of Laghman province by MADERA in 1996.

No.	Name or pedigree	Yield	Rank
1	Swat-2	6819	1
2	Kunhar	5990	2
3	DR83	5299	6
4	Pakal	5193	7
5	RP 1670-7613-3-2	5525	4
6	Vikramarya-1293	4534	9
7	Mansorouar-1337	late	
8	Ravi-1328	5909	3
9	Tiaching Native-1	4955	8
10	Local (Behsudai)	5431	5
	LSD at P= .05	458	
	CV %	5.3	
	Grand mean	5965	

Table 10. Mean yield (kg/ha), overall mean yield and rank of short grain rice lines tested in 2 locations in Afghanistan during 1996.

No.	Name or pedigree	Location mean yield and rank				Overall	
		Nangrahar	R	Laghman	Rank	Mean	Rank
1	Swat-2	6676	3	6819	1	6748	2
2	Kunhar	2941	9	5990	2	4466	8
3	DR83	5623	8	5299	6	5461	7
4	Pakal	9414	1	5193	7	7304	1
5	RP 1670-7613-3-2	5730	7	5525	4	5628	6
6	Vikramarya-1293	7184	2	4534	9	5859	4
7	Mansorouar-1337	5739	6				
8	Ravi-1328	940	10	5909	3	3425	9
9	Tiaching Native-1	6466	5	4955	8	5711	5
10	Local	6522	4	5431	5	5977	3
	LSD at P= .05	1174		458			
	CV %	15.3		5.3			
	Grand mean	5273		5965			

Table 11. Mean yield (kg/ha), overall mean yield and rank of long grain rice lines tested in 5 locations in Afghanistan during 1996.

No	Name or pedigree	Takhar		Balkh		Nangrahar		Kunar		Laghman		Overall mean	
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R
1	IR 62874-43-2-3	4444	10	4323	4	4881	2	4510	5	5109	6	4653	8
2	CT 7616-11-2-2-M-M	6385	6	7310	8	5032	1	4145	6	3993	8	5373	3
3	IR 62873-417-4-1	6770	5	3688	9	3877	10	4010	7	5026	7	4674	6
4	IR 62871-544-3-6	6965	4	4036	7	4344	6	4645	4	5197	3	5037	5
5	H232-58-2	7206	2	4227	5	3897	9	3854	8	3963	9	5422	2
6	IR 62871-166-2-2	7560	1	5131	2	4261	7	4843	1	5687	1	5496	1
7	IR 62873-244-2-10	5425	9	3225	10	4388	5	3583	9	5479	2	4420	10
8	Lawangai	6990	3									6990	
9	Basmati 385	6153	7			4405	4	4833	2	5187	4	5145	4
10	Local	5492	8	4039	6	4149	8	4687	3	3771	10	4428	9
11	RP 1670-7613-3-2			6044	1							6044	
12	IR 62873-147-4-10			4939	3	4700	3	3052	10	5183	5	4469	7
	LSD at P= .05	1089		939		662		1218		1366			
	CV %	11.84		14.93		10.37		19.46		16.39			
	Grand mean	6339		4335		4398		4317		4860			

Table 12. The mean yield, overall mean yield in kg/ha and rank of 10 varieties of shrot grain rice tested in (97NRYTS1) in 3 locations of Afghanistan during 1997.

		Nangrahar		Takhar		Balkh		Overall mean	
No	Name	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	SWAT-2	6036	5	9123	1	7751	1	7637	1
2	RP 1670-7613-3-2	3838	7	7578	6	4397	7	5271	7
3	IR50	3722	8	8572	2	6010	3	6101	4
4	H232-58-2	3089	9	8218	3	4948	6	5418	5
5	SPTLR81388	3037	10	7917	4	4950	5	5301	6
6	VIKRAMARYA 1293	6795	1	404	9	433	10	2544	9
7	TACHANG NATIVE-I	6213	4	55	10	527	9	2265	10
8	MANSOUR 1337	6589	2	2441	8	3387	8	4139	8
9	DR83	4931	6	7847	5	7703	2	6827	2
10	Local check	6574	3	7374	7	5669	4	6539	3
	Location mean	5082		5953		4578			
	LSD at P= 0.05	1034		985		1867			
	% C. V.	14.03		11.36		28.12			

Table 13. The mean yield, overall mean in kg/ha and rank of 10 varieties of short grain rice tested in (97NRYTS) in 3 locations of Afghanistan during 1997.

No	Name	Nangrahar		Takhar		Balkh		overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	CR 1136	6564	5	1953	9	983	10	3167	9
2	SOURKH KHOSHA	6711	2	2778	7	2995	7	4161	7
3	IR504040-8-1-1-3	6616	3	1080	10	1008	9	2901	10
4	SONASATI	6591	4	4748	6	4542	6	5294	6
5	PAK1379	4869	9	8342	1	7873	1	7028	1
6	KC15	4748	10	8338	2	7483	2	6856	2
7	IR41993-31-2-2-3	6298	7	2020	8	1934	8	3417	8
8	BG1230	5036	8	6614	4	4547	5	5399	5
9	UTI	6386	6	5847	5	6533	3	6255	4
10	Local	6895	1	7024	3	5148	4	6356	3
	Location mean	6071		4874		4305			
	LSD at P= 0.05	718		992		890			
	% C. V.	8.15		14.03		14.26			

Table 14. The mean yield, overall mean yield in kg/ha and rank of 15 varieties of long grain rice tested in (97NRYTL1) in 3 locations of Afghanistn during 1997.

NO	NAME	Locations						Overall Mean	R
		NGR	R	BLK	R	TKR	R		
1	RP 1670-7613-3-2	5033	1	7603	2	7434	1	6690	1
2	IR62871-166-2-2	4109	3	5131	8	7232	2	5491	3
3	IR62873-147-4-10	4129	2	5573	6	5990	8	5231	4
4	IR62874-73-2-3	3585	9	4743	10	6375	4	4901	8
5	H232-58-2	3507	10	3366	13	6325	5	4399	11
6	CT7616-11-2-2-M-M	3652	7	4000	11	5762	10	4471	10
7	IR62873-244-2-10	3853	5	2949	15	5590	11	4131	13
8	BASMATI-385	3702	6	3322	14	6021	7	4348	12
9	LAWANGI	2824	12	6363	3	5585	12	4924	7
10	IR62873-417-4-1	2519	13	6355	4	6127	6	5000	5
11	ZERAMAEN	1752	15	4861	9	3994	15	3536	15
12	ALUM GULI	3625	8	5916	5	5437	13	4993	6
13	GARMA BARAH	2355	14	5362	7	4538	14	4085	14
14	SARDA BARAH	3201	11	7836	1	5834	9	5624	2
15	IR62871-544-3-6	4042	4	3914	12	6633	3	4863	9
	Location mean	3459		5153		5925			
	LSD at P= 0.05	963		1387		773			
	C.V. %	19.52		18.86		9.14			

NGR= Nangrahar, BLK= Balkh, TKR= Takhar, R= Rank

Table 15. The mean yield, overall mean yield in kg/ha and rank of 10 varieties of long grain rice tested in (97NRYTL2) in 3 locations of Afghanistan during 1997.

NO	NAME	Yields in Locations						Overall Mean	R
		NGR	R	TKR	R	BLK	R		
1	DR 33	3607	10	6936	1	8117	4	6220	4
2	PAK427-8-14-1	6592	1	3650	6	2747	6	4330	6
3	MANSAROUR 1372	5389	6	2735	8	1323	9	3149	8
4	IR963-8-1-1-3	4750	9	4716	5	3952	5	4473	5
5	PAK1379-9-1-1	6227	3	932	9	1498	8	2886	9
6	IR5287-15-2-1-2	5552	5	6594	3	8138	3	6761	3
7	KC 1344	5805	4	5613	4	9141	2	6853	2
8	DR32	5215	7	809	10	898	10	2307	10
9	SAYBARE 1289	4895	8	6707	2	10125	1	7242	1
10	BASEMATI-385	6542	2	3020	7	1735	7	3766	7
	Location mean	5457		4171		4767			
	LSD at P= 0.05	979		675		1427			
	C. V. % =	12.37		11.46		20.63			

NGR= Nangrahar, TKR= Takhar, BLK= Balkh, R= Rank

Table 16. Yearly mean yields in kg/ha, numbers of locations, overall means and rank of short grain rice varieties tested in Afghanistan during 1990-97.

No.	Name or Pedigree	Yields in Years and Locations														Overall Mean	No. Of Loc	Rank	
		90	Loc	92	Loc	93	Loc	94	Loc	95	Loc	96	Loc	97	Loc			A	B
1	Swat 2	7299	4	6893	4	7503	4	7455	3	6678	2	7679	3	7637	3	7309	23	1	
2	Kunhar			6136	4	5483	4	5688	2	5013	2	4465	2			5357	14	8	
3	DR83			5123	4	6574	4	6844	2	5747	2	5461	2	6827	3	6096	17	4	
4	Pakal			6197	4	6309	4	6844	2	4744	2	7304	2			6280	14	3	
5	JP 5	6028	4	5337	4	6053	4									5806	12	6	
6	RP 1670 -7613 -3-2									6219	2	6672	3	5271	3	6054	8	5	
7	Vikramorya 1293									5394	2	6310	3	2544	3	4749	8	10	
8	Mansorouar 1337									2082	2	5739	1	4139	3	3987	6	12	
9	Ravi 1328				4					6628	2	4082	3			5355	5		8
10	Local	4526	4	5893	4	5530	4	6052	2	5226	2	5545	3	6448	6	5603	25	7	
11	Tayching Nativ 1									5391	2	5711	2	2265	3	4456	7	11	
12	IR 50							6223	1			6911	2	6101	3	6412	6	2	
13	Batahavan 40							2972	1							2972	1		16
14	SPTLR 81366 PT 627							3607	1			7051	1	5301	3	5320	5	9	
15	" 81399 PTG 9 2							5126	1							5126	1		11
16	KS 282							4201	1							4201	1		15
17	Aron gana 688							6517	1			6917	1			6717	2		1
18	IR 39357 -133- 2- 2- 2			5267	3											5267	3		10
19	VTI	5022	4											6255	3	5639	7		7
20	DR 82			4998	4											4998	4		12
21	H232 -58 -2											7091	1	5418	3	6255	4		4
22	Pak 1370											6064	1	7028	3	6546	4		2
23	KC15											6037	1	6856	3	6447	4		3
24	CR1136											6488	1	3167	3	4828	4		13
25	Sourkh Kosha											6413	1	4161	3	5287	4		9
26	IR41993 -31 -2 -2 -3											6169	1	3417	3	4793	4		14
27	BG1230											5947	1	5399	3	5673	4		6
28	Sonasati											6307	1	5294	3	5801	4		5

Rank A: Mean Yield of group of varieties which have been tested 5-25 locations from 3-7 years
Rank B: Mean Yield of group of varieties which have been tested 1-7 locations from 1-2 years
Data of 1991 not included.

Table 17. Yearly mean yields (kg/ha.) numbers of locations, overall means and rank of fine rice varieties tested in Afghanistan during 1990-1997.

No.	Name or Pedigree	Yields in Years and Locations														Overall Mean	No. Of Loc	Ranks	
		1990	Loc	92	Loc	93	Loc	94	Loc	95	Loc	96	Loc	97	Loc			A	B
1	Basmati 385	4981	2	4830	1	5927	2	6735	2	4934	2	5145	4	4348	3	5271	17	6	
2	Kashmir Basmati	4106	4	4860	1	6011	2									4992	7	10	
3	Local	4732	4	4900	1	5259	4	5019	3	4531	3	4428	5			4812	20	12	
4	IR -50			6440	1	7188	2									6814	3		3
5	IR 39357 -133- 2- 2- 2			7175	1	6982	2									7079	3		2
6	IR 32307- 107- 3- 2- 2			3325	1	6700	2									5013	3		11
7	Swat 1	3986	4													3986	4		
8	KS 282	6250	1													6250	1		
9	IR 6	4718	1													4718	1		
10	IR31787-41-2-2-3-3			6685	1	6783	2									6734	3		4
11	IR 64			1820	1											1820	1		
12	IR 32429-47-3-2-2			6825	1	7336	2									7081	3		1
13	IR 258958 -60- 2- 3			5915	1	7160	2									6538	3		5
14	IR 59645-146-2-2 -6- 2					5133	3									5133	3		
15	IR 62874 -73- 2- 3					5446	3	5762	1	6066	3	4653	5	4901	3	5366	15	5	
16	IR 61971- 279- 2- 1					5626	3	5448	1							5537	4		8
17	IR 62871 -166- 2- 2					5913	3	6203	3	6223	3	5496	5	5491	3	5865	17	2	
18	IR 62871 -175- 1- 11					5324	3	4820	1							5072	4		10
19	IR 62871-175-8-6					5426	3	5069	1							5248	4		9
20	IR 62871- 275- 2 -6					5810	3	5796	3							5803	6		6
21	IR 62871 -544 -3 -6					5901	3	6582	3	5661	3	5037	5	4863	3	5609	17	3	
22	IR 62873 -227 -1 -2					5481	3	4069	1							4775	4		12
23	IR 62873 -244- 2 -10					5870	3	6100	3	5750	3	4420	5	4131	3	5254	17	8	
24	IR 62873 -278 -4 -3					6026	3	5412	3							5719	6		7
25	IR 62873-417-4-1					5626	3	5832	3	5199	3	4674	5	5000	3	5266	17	7	
26	IR 62673 -147- 4- 10					5583	3	6055	3	5751	3	4469	5	5231	3	5418	17	4	
27	CT7616 -11-2- 2-M-M							5138	1	4690	3	5373	5	4471	3	4918	12	11	
28	H232 -58- 2							5030	1	6049	3	5422	5	4399	3	5225	12	9	
29	RP 1670 -7613 -3-2							6258	1	8113	1	6044	1	6690	3	6776	6	1	

Rank A: Group of varieties which have been tested 3-7 years in different locations.
Rank B: Group of varieties which have been tested 2 years " " "
Data of 1991 has not been used.

Description of Improved Wheat Varieties Distributed to Farmers in Afghanistan

1. **Atay-85** (Hys/7C) is a facultative amber grain color bread wheat variety from Turkey. It was first tested in Afghanistan in 1989-1990. Its yield performance from 1991-97 has been recorded (5.28) Mt./ha in 28 location (Table 5). Its test weight is 74.8 kg/hl, its thousand grain weight is 39.6 g, and the number of grains per spike are 60. It is late maturing variety with the average height of 94 cm. The disease resistant characteristics and high yielding potential of Atay-85, encouraged FAO /SCA seed program to import 500 kg seed of this variety from Turkey. This seed was increased in Swat district of NWFP in 1991 and sent to Logar and Wardak provinces of Afghanistan. It is widely adapted to east central provinces of the country. Farmers' field tests data of this variety in Herat, Takhar, Kabul, and Behsud 1 of Wardak (Hazarajat) revealed that it is adapted to these areas as well. FAO seed project has also taken seeds of this variety to Herat, Bamyan and Helmand provinces. Its yield in these provinces are high and the farmers are happy with it. It was resistant to stripe rust and tolerant to cold temperatures but in 1997-98 crop season it has been reported to have shown susceptible response to leaf and stripe rust in Kabul, Logar, Wardak and Ghazni provinces of Afghanistan.
2. **Pamir-94** is a cross of YMH/TOB//MCD/3/LIRA"s", has a cross number of SWM12289 and pedigree of - 7M-OM-8M-2M - OYE. Its origin is Mexico/Turkey. It has been put in 4th IWWSN #39 in 1988-89 which was sent by CIMMYT/Turkey International Winter Wheat Improvement Program and Bahari Dagdas International winter cereal Research Center, in Konya, Turkey. This observation nursery was tested in Kabul province of Afghanistan in Darul Aman Agricultural Research Center at elevation of 1825 meter above the sea level. It was selected as a good line with the yield of 4400 kg/ha. In 1989-1990 it was included in the 5th IWWSN and was tested in Kabul, Logar and Baghlan provinces. It yielded 32% higher in Kabul and 4 % higher in Baghlan than the location mean. In 1990-1991 it was included in 6th IWWSN and tested in 4 location of Afghanistan.

   In 1991-1993 it was tested in yield trials in 8 locations. Based on its high yield and cold tolerance characteristics, this lines was named Pamir-94 by SCA after Pamir mountain ranges and released as a new wheat variety for cooler areas of Afghanistan. It is a facultative bread wheat variety with the mean yield of (6.28 Mt./ha) from 1991-1997 in 25 locations (Table 5). In comparison to local check (Pirsabak-85) it has produced 30% more yield. This line has also done well in Turkey and was recommended for release as BME9. It is also widely adapted in other zones of Afghanistan but, its yield is high in cooler areas. It is resistant to stripe rust. It is about one week late than other varieties, therefore for the place where they have birds damage is a problem, this variety suits well. The average plant height of this variety is 97 cm. Its grain color is light red and its chaff color is white. The overall mean thousand kernel weight is 39.7 grams. Days to heading in cool areas such as Kabul, Logar, Wardak and Ghazni are 211 and it matures in 279 days. But in other areas of the country where the winters are mild, it takes 189 days to mature. Its response to leaf rust is 5R and to stripe rust is MR in 6 years data.

Table 18. Mean yield (kg/ha) of plant density based on spacing between plants on rice in Takhar province of Afghanistan in 1996.

No	Row Spacing cm	Panicles per hill	1000 kernel weight g.	Yield kg/ha	Rank
1	10	13.8	24.23	8922	5
2	15	18.4	24.06	9467	4
3	20	21.8	24.23	9694	3
4	25	24.9	23.57	10056	2
5	30	26.2	25.47	10212	1
	LSD at 5%	2.3	1.14	1555	
	CV %	7.1	3	10.44	
	Grand mean	21	24.31	9670	

Table 19. Mean panicles differences in rice based on numbers of plants per hill in Takhar province of Afghanistan during 1996.

No	No. Plants per hill	No. Panicles per hill	No. kernel per panicle	Yiled kg/ha	Rank
1	2	9.23	89.5	8787	5
2	4	5.64	76.5	9596	3
3	6	3.82	70.7	9476	4
4	8	3.21	68.5	9899	1
5	10	2.61	65.5	9724	2
	LSD at 5%	0.64	10.65	670	
	CV%	8.47	9.3	4.78	
	Grand mean	4.9	74.15	9496	

Table 20. Mean yield (kg/ha) in rice date of planting experiment in Takhar during 1996 and 1997.

No	Dates	Yield 1996	Rank	Yield 1997	Rank
1	Jun-05	7518	3	9703	2
2	Jun-10	7665	1	9806	1
3	Jun-15	6926	5	8197	3
4	Jun-20	7606	2	7723	4
5	Jun-25	6994	4	7164	5
6	Jun-30			6181	6
7	Jul-05			4805	7
	LSD at 5 %	1107			
	CV %	9.97			
	Grand mean	7342			

Table 21. Mean yield (kg/ha) in rice date of planting experiment in Nangrahar during 1996 and 1997.

No	Dates	Yield 96	Rank	Yield 97	Rank
1	Jun-15	4428	3	5788	3
2	Jun-20	5663	1	6099	2
3	Jun-25	5742	5	6231	1
4	Jun-30	6355	2	5262	4
5	Jul-05	6281	4	4806	5
	LSD at 5 %	832		1170	
	CV %	9.48		13.47	
	Grand mean	5694		5637	

Table 22. Mean yield (kg/ha) of rice in the rate fertlizer experiment in 1996 and 1997 in Takhar and Nangrhar provinces of Afghanistan.

No	Treatments (Kg/ha)		Nangrahar		Takhar
	N	P	1996	1997	1996
1	0	0	4251	4422	6374
2	0	57	3248	4395	7284
3	0	115	3322	4720	8373
4	69	0	5684	6013	7132
5	69	57	5941	5921	8051
6	69	115	5369	5490	8741
7	138	0	5896	5909	7505
8	138	57	6149	5598	7468
9	138	115	6329	5876	8704
	LSD at 5 %		1208	1009	1152
	CV %		16.13	12.87	10.2
	Grand mean		5132	5371	7734

PULSES

Introduction

Pulses belong to the leguminous family. They are important food and forage crop in Afghanistan. Commonly grown and utilized food legumes in the country are lentil (*Lense culinaris L*), mung bean (*Phaseolus mungo L.*), dry beans (*Phaseolus vulgaris L.*), peas (*Pisum sativum*), chickpea (*Cicer arietinum L.*) and faba beans (*Vicia faba L*). Mung beans and dry beans are more frequently grown than chickpea and faba bean. Chickpea are planted under rainfed conditions in north eastern parts of the country (extensively in Kalfgan district of Takhar province), in north west in the Gulran and Kushk districts of Herat province and in Moqur district of Ghazni. Faba beans are grown in central highlands such as Wardak and Bamyan provinces. The yields of pulses are generally low and according to 1991 survey of SCA the following yields have been recorded for some crops:

Pulses	Mean Yield (kg/ha)
Dry bean	665
Pea	560
Mung bean	770

There is an urgent need to increase the yield of pulse in the country because of their high nutritional value, good storability, expense and unavailability of animal protein, and its important role in soil improvement. For the identification of high yielding varieties of food legumes, SCA (Swedish Committee for Afghanistan) conducted many trials on dry beans from 1992-1995 and on Chickpea during 1993-1995. In 1996, the FAO crop improvement project (UNO/AFG/001/DPS) conducted variety trials on dry beans, chickpeas and lentils in Wardak, Nangrahar and Takhar provinces. In 1997, one national chickpea yield trial, one preliminary chickpea yield trials and 5 chickpea screening nurseries were conducted in Herat, Balkh, Takhar and Ghazni provinces under both irrigated and rainfed conditions..

Similarly there were three yield trials of lentil in Takhar, Nangrahar and Herat provinces and one trial in Balkh province in 1997 crop season. There were 5 dry bean yield trials one each in Herat, Ghazni, Wardak, Nangrahar and Takhar provinces during 1997. The results of these trials are as follows:

Recommendations

Based on our finding in the test locations, a number of top yielding promising lines in food legumes are considered for increase as varieties in different crops as follows:

Beans: The results of 11 variety trials from 1992-1997 in 6 locations showed the variety 5229 UI, kidney bean with bush growth habit, Arapaho, pinto bean with climbing growth habit and CO-1760, white (great northern type) with bush growth habit are the top yielding varieties (Table 4, Annex 6). Table 2 (Annex 6) shows that the red kidney bean variety Viva with bush type growth habit produced the highest yield. Viva is reported to be high yielding in Takhar province where farmers can get two crops per year. Therefore, these four varieties should be multiplied in pulses growing area of Afghanistan.

Chickpea: The results of over years and location data revealed that line FLIP93-93C and ILC-482 are higher yielding lines and out yielded the local check by 52% and 14% respectively.

These lines are under small seed increase in Takhar, Balkh and Herat provinces for further multiplication and distribution to farmers in these locations.

Lentil: The results of the lentil yield trials over years and locations showed that the large seeded lentil lines 78S 26002 and FLIP92-15L are the highest yielding lines and should be considered for multiplication in Herat, Balkh and Takhar provinces.

Materials and Methods (1996 and 1997)

Bean Trials 1996-1997: The trials on dry beans were conducted in randomized complete block design (RCBD) in 4 replication. The plot size was 4 rows, 4 meter long, 60 cm space between rows and 15 cm spacing between plants. Only the two central rows with 3 meter length were harvested for yield determination. Diammonium phosphate (DAP) fertilizer (18:46:0) was used at the rate of 75 kg/ha. All the necessary data was taken during the growing season.

In 1997, 10 dry bean lines were planted in a yield trial in 5 locations (Takhar, Herat, Ghazni Nangrahar and Wardak) province of Afghanistan. The design of the experiment was RCBD with 4 replications. There were 6 rows in each plot with a row length of 4 meters. The distance between row was 50 cm. The 4 middle rows, 3 meter long were harvested for yield. Only DAP fertilizer was applied at the rate of 125 kg/ha at planting time.

Chickpea Trials 1996-97: One chickpea international yield trial consisting of 24 varieties was conducted in Takhar province during 1996 crop season. The design was randomized complete block with 3 replications. There were 4 rows, 4 meter long, 35 cm apart. The two central rows with 3.5 meter length were harvested for yield, all necessary data was recorded during the growing period.

In 1997, a national chickpea yield trial consisting of 10 lines was planted in RCBD design in Herat and Balkh under irrigation, the same trial was planted in Takhar under both irrigation and rainfed conditions. The experiment was replicated four times in RCBD . There were 6 rows in each plot with a row length of 4 meter and the distance between row was 45 cm. Plant to plant space was 10 cm. The amount of N and P was 40 and 30 kg/ha. respectively. The plot size was 10.8 m^2 and the area harvested was 7.2 m^2.

A preliminary chickpea yield trial was also arranged in RCBD design. There were 4 replications and the plot size was 4 rows, 4 meter long. The distance between row was 45 cm and the distance between plants was 10 cm. The planted area was 7.2 m^2 and the harvested area was 3.6 m^2. The amount of N and P was 40 and 30 kg/ha respectively.

One Chickpea International Drought Tolerance Nursery (CIDTN) consisting of 61 lines, was planted in Takhar province for observation. Each line of the nursery was planted in one row 2 meter long and 45 cm apart.

One Chickpea International Cold Tolerance Nursery (CICTN) consisting of 76 lines was planted in Takhar province. The design of the experiment was RCBD, with 2 replications. Each entry was planted in one row, 2 meter long, spaced 45 cm. apart under rainfed condition on December 12, 1996. An area of 0.9 m2 was harvested for yield determination on June 22,1997.

Chickpea International Screening Nursery (CISN-W) for winter was planted in Takhar and Ghazni provinces. Sixty four entries were planted in simple lattice in two replications. Each entry was planted in one row 4 meter long and 45 cm apart. The total planted area was 1.8 m2 and the total harvested area was 1.8 m2 in Takhar and 1.75 m2 in Ghazni province. The nursery

was planted on December 23, 1996 and harvested on June 10 1997 in Takhar. The date of sowing of the nursery in Ghazni was 25 November 1996 and it was harvested on 11 August 1997.

Chickpea International Screening Nursery (CISN-Sp) for spring planting was planted in Takhar on 16 February 1997 and Ghazni provinces on 30 April 1997. The design, number of replications, entries, number of rows, row length , space between rows and area harvested was the same as chickpea international screening nursery for winter. The time of harvesting in Takhar was on 30 June 1997 and in Ghazni it was on 3 September 1997.

The Chickpea International Yield Trial-Winter (Mediterranean Region) was planted in Takhar, and Ghazni provinces in simple lattice design with 3 replications. The trial consisted of 25 entries. There were 4 rows in each plot with 4 m length, 25 cm spacing between rows. It was hand weeded 2 times without irrigation. During harvesting in Takhar 2 central rows 4 m long (2.8 m^2) were harvested. In Ghazni province, the row length was 3.5 m, 25 cm apart and 5 irrigations were given. It was hand weeded 4 times. The area harvested was 1.75 m2.

Lentil Yield Trials 1996-97: There were 2 Lentil International Yield Trials one on small seeded and one on large seeded lentils, each consisting of 24 varieties. The small seeded lentils yield trial was planted in Nangrahar and large seeded lentil yield trial was sown in Takhar province. The design of the experiments was RCBD with 3 replications. The plot size was 4 rows, 4 meters, 25 cm apart. During harvesting the 2 middle rows with 3 meter length were harvested for yield calculation. All the agronomic practices were uniformly applied during the growing season.

Lentil International Cold Tolerance Nursery (LICTN-97) was tested in RCBD in 2 replications in Takhar province under rainfed conditions. There were 25 entries in each replication with the two rows per plot, 4 m long and 25 cm apart. The rate of fertilizer was 40 kg N and 30 kg P_2O_5 /ha. The nursery was planted on 17 November 1996 and harvested on 22 June 1997.

Lentil International Yield Trial Large Seed (LIYTL-97) consisting of 25 entries was planted in sample Lattice design in 3 replications in Shisham Bagh agricultural research station in Jalalabad, Nangrahar and in Urdo Khan agriculture research station in Herat. The plot size was 4 rows, 4 m long and the distance between rows was 0.25 m. The two central rows, with 3 meter length was harvested for yield determination.

Lentil International Yield Trial Small Seed (LIYT-S-97) with 25 entries was planted in simple lattice design in 3 replications in Shesham Bagh Agricultural Research station in Jalalabad, Nangrahar and in Urdo khan agriculture research station in Herat. There were 4 rows per plot, 4 meter long, 0.25 meter apart. At harvest time the 2 middle rows with 3 meter length were harvested.

The National Lentil Yield Trial was conducted in Takhar under irrigated and rainfed, and in Balkh, Herat and Nangrahar provinces under irrigated conditions. The design of he experiment was RCBD. There were 4 replications and 10 entries or treatments in each replication. There were 6 rows 4 meter long per plot with a spacing of 25 cm between rows. The rate of fertilizer was 40 kg N and 30 kg P_2O_5 /ha. all applied at planting time.

One Pea International Adaptation Trial (PIAT-97) with 25 entries in a simple lattice with 3 replications was planted on November 24, 1996 in Jalalabad (Shisham Bagh) Agricultural Research Station. The plot size was 4 rows, 4 m long and the distance between rows was 0.30 m. At harvest time the 2 central rows with 3.5 meter length were harvested. The trial was irrigated 4 times during the growing season.

Result and Discussions 1996 and 1997

Beans: Table 1 (Annex 6) shows the average yield in kg/ha of the 10 varieties of dry beans in Wardak provinces in 1996. The variety 5229 UI with the yield of 2631 kg/ha, CO 1760 (2628 kg/ha), Arapaho (2509 kg/ha), Othello (2247 kg/ha), NW-63 (2150 kg/ha) and Olathe with the yield of 1984 kg/ha ranked 1, 2, 3, 4, 5 and 6th, respectively. There are no significant differences between their yields. Compared to local check (1181 kg/ha.) these lines produced 122%, 122%, 112%, 90%, 82%, and 68 % higher yield. This year was an exceptionally good year for dry bean production in the area.

The combined data of 1992-96 represents the average yield of 14 top varieties out of 34 varieties tested for at least 2 years in 4 locations supports the data of 1996 Table 2 (Annex 6). The variety Viva with yield of 3445 kg/ha, 5229-UI (2933 kg/ha), Arapaho (2918 kg/ha), 55037 UI (2780 kg/ha), Olathe (2776 kg/ha), NW-63 (2762 Kg/ha), CO 55241 (2711 kg/ha), and CO-1760 (2514 kg/ha) ranked 1, 2, 3, 4, 5, 6, 7 and 8 respectively. These lines out yielded the local check by 75%, 49%, 48%, 42%, 41%, 40%, 38%, and 28%. The top ten yielding lines have been selected for 1997 for further testing and seed multiplication in six zones in the country.

Table 3 (Annex 6) shows that in 1997 in Agam district of Nangrahar province, the highest mean yield of 3652 kg/ha was produced by variety CO 1760, but it is not significantly different from the mean yield of variety Arapaho (3584 kg/ha), Olathe (3506 kg/ha), Othello (3363 kg/ha), 5229UI (3189 kg/ha), local check (3016 kg/ha) and UI-59 (2652 kg/ha). These are very high yielding lines with a mean yield rankings of 1, 2, 3, 4, 5, 6 and 7 respectively.

In Herat province the highest mean yield was recorded for local check (529 kg/ha) followed by 5229UI (512 kg/ha), NW-63 (490 kg/ha) and Othello (431 kg/ha) and ranked, 1, 2, 3, and 4 respectively. The mean yield differences of these four lines are not significant, but highly significant from other lines (Table 3, Annex 6)

In Ghazni province in 1997 the mean yield of 5229UI (1068 kg/ha) is significantly higher than all other lines and exceeds the local check by 898 kg/ha (Table 3, Annex 6). The yield differences of OLATHE (916 kg/ha), NW-63 and Othello (858 kg/ha) are not significant. These lines ranked 1, 2, 3, and 4 respectively.

In Wardak province the variety ARAPAHO gave the highest mean yield (978 kg/ha) followed by 5229 UI (878 kg/ha). Similarly bean variety Olathe yielded (797 kg/ha) with no significant differences between their mean yields but, significantly different from the other 6 lines . They ranked 1, 2, and 3 respectively (Table 3, Annex 6).

In Takhar province the local variety produced the highest mean yield of 2347 kg/ha and it is significantly higher than all others. The variety 5229 UI became the second top yielding (1043 kg/ha) which is significantly higher than others. The variety UI-59 (644 kg/ha) and variety G89003 (615 kg/ha) are also high yielding lines and ranked 3 and 4th respectively (Table 3, Annex 6).

The combined data shows that variety 5229UI ranked 1 (1338 kg/ha) followed by local check (1291 kg/ha) which ranked second, Arapaho (1226 kg/ha) became 3rd and Othello (1170 kg) ranked 4th in 5 locations.

Table 4 (Annex 6) shows the combined data over years (1992-1997) and locations for 10 bean varieties. The top five yielding bean lines are 5229UI (2301 kg/ha), Arapaho (2218 kg/ha), CO-1760 (2087 kg/ha), Olathe (1957 kg/ha) and NW-63 (1942 kg/ha) ranked 1, 2, 3, 4, 5

respectively. In comparing to the local variety they have given 56% 50% , 41%, 32%, 31%, more yield.

Chickpea: The yield performance of chickpea 7 varieties tested in Balkh province in 1993 and in Baghlan province in 1995 shows that FLIP 81-293C has given the highest yield of 1098 kg/ha (Table 5, Annex 6), followed by ILC-482 and local with a mean yielded of 882 kg/ha. FLIP 81-293C gave 24% more yield than ILC-482 and local check.

The results of chickpea international trial during 1996 in Takhar province are summarized in Table 6 (Annex 6). ILC-482 with the average yield of 5320 kg/ha is the top yielding line followed by FLIP 92-40C (5014 kg/ha), FLIP 92-169C (4918 kg/ha), FLIP93-181C (4735 kg/ha), and FLIP93-93C with the yield of 4701 kg/ha and ranking of 1 ,2, 3, 4 and 5th respectively. In comparing to local (4456 kg/ha) these lines yielded 19%, 13%, 10%, 6 % and 5% percent more yield.

The results of the national chickpea yield trial have been arranged in (Table 7, Annex 6). In Takhar province, the highest yield (3292 kg/ha) has given by the variety number 7 (FLIP 93-93). This yield is not significantly different from the mean yield of entries 1, 2, 3, 5, 7, 8, 9 and 10. Compared to the local check entry 10, the entries number 7, 5, 8, and 1 have produced 12, 8, 8, and 6 % more yield. Under rainfed condition the local variety number 10 has yielded 1205 kg/ha. It is significantly higher yielding than the variety 1 and 2.

In Balkh province the highest mean yield of (1093 kg/ha) was recorded for FLIP 92-169C, but it is not significantly higher than the mean yield of FLIP 91-52C (731 kg/ha), FLIP93-03C (782 kg/ha), ILÇ 482 (783 kg/ha) and local check (799 kg/ha). FLIP 92-169C has produced 37% more yield than the local check (Table 7, Annex 6).

In Herat province the highest mean yield of 882 kg/ha was produced by the local check variety. Except for ILC 482, this line has significantly out yielded all other entries (Table 7, Annex 6).

Under rainfed conditions in Takhar province, the highest yield (1205 kg/ha) was produced by the local check which is significantly higher than FLLIP 91-52C and FLIP 91-63C.

The overall mean yield and rank of 10 chickpea lines in 3 locations (Table 7, Annex 6) revealed that local check is highest yielding (1456 kg/ha), followed by FLIP 93-93C (1445 kg/ha), and ILC 482 (1430 kg/ha) with ranking of 1, 2, 3 respectively.

The result of chickpea preliminary yield trial is summarized in Table 8, Annex 6 in 3 locations (Takhar, Herat and Balkh). In Takhar province the highest mean yield was given by FLIP93-148C (2909 kg/ha). It is significantly higher than other lines except FLIP93-147C (2411 kg/ha). It has yielded significantly higher than entry 2, 5 and 6. Entry 4 ranked 1, while entries 3 and 10 ranked 2nd and 3rd respectively. Compared to local check, entry number 4 has given 30 % and the entry 3 has produced 8% more yield.

In Herat province the entry 8 has given the mean yield of 1012 kg/ha, the entry no. 10 the local check with mean yield of 988 kg/ha and the entry no. 4 with the mean yield of 556 kg/ha and ranked 1, 2, and 3 respectively (Table 8, Annex 6). However there is no significant difference in mean yields of entry 8 and 10. Both are significantly higher than others.

In Balkh province no significant differences were observed in the mean yields of entry 1, 2, 3, 4, 7, 8, and 9 but, the highest mean yield was recorded for entry 4 (812 kg/ha). Entry 2 with the mean yield of 760 kg/ha and entry 8 with the mean yield of 724 kg/ha. They ranked 1, 2, and 3rd

respectively. The local check has produced the mean yield of 482 kg/ha. Compared to local check entries 4, 2 and 8 produced 68%, 58% and 50% more yield.

The overall mean yields data shows that the entry 4 (1426 kg/ha), entry 8 (1293 kg/ha) and entry 10 (1234 kg/ha) are top ranking and highest yielding entries (Table 8, Annex 6).

In the International Chickpea Drought Tolerance Nursery of 61 lines, the following 9 top yielding drought tolerant lines of diverse origin have been selected for planting in 1997-98 crop season in Takhar provinces. These are:

1. ILC28
2. ILC71
3. ILC 142
4. ILC 477
5. ILC 1306
6. ILC 2516
7. ILC 2553
8. ILC 3843
9. ILC 4339

In Chickpea International Cold Tolerance Nursery of 76 lines, 9 top yielding cold tolerant lines have been selected for planting in 1997-98 in Takhar province. The selected lines are:

1. FLIP 93-252C
2. ILC 5663
3. FLIP 93-262C
4. SEL 93TH144
5. FLIP 93-247C
6. FLIP 93-245C
7. FLIP 93-259C
8. FLIP 83- 90C
9. FLIP 93-244C

The Chickpea International Screening Nursery - Winter which was planted in Takhar and Ghazni provinces was statistically analyzed and summarized in Table 9 (Annex 6). Based on the overall mean yield, the following top 9 lines were selected for further evaluation:

1. S95243
2. S95287
3. FLIP 94-50C
4. S95343
5. S95336
6. S95379
7. S95325
8. S95428
9. FLIP 94-19C

These lines are from the joint research of ICARDA/ICRISAT program and their yields are not significantly d

ifferent from each other. They have been selected to be planted in Takhar province for 1998 crop season.

The Chickpea International Screening Nursery - Spring, 64 lines tested in 3 locations (Takhar, Ghazni and Balkh) summarized in (Table 10, Annex 6), the following top 9 lines have been selected based on their overall mean yield for further testing in 1998 crop season in Takhar province:

1. FLIP 94-25C
2. FLIP 94-40C
3. S95321
4. S95307
5. S95191
6. FLIP 94-52C
7. S 95188
8. FLIP 94-39C
9. FLIP 94-114C
10. Local Check

The chickpea International Yield Trial for Mediterranean Region Trials from Takhar and Ghazni provinces have been analyzed. The performance of this trial was not satisfactory in Ghazni therefore, only the data of Takhar province is used. From the 25 varieties tested in 1996-97 crop season. 19 top yielding varieties have been selected for planting during 1998 in Takhar province.

Lentil: The data of Lentil International Yield Trial of 24 small seeded varieties conducted in 1996 in Nangrahar is summarized in Table 11 (Annex 6). The highest yielding lentil line (FLIP 92-19L) produced of 2256 kg/ha, followed by FLIP 92-36L (2113 kg/ha), FLIP 90-22L (2111 kg/ha), FLIP 92-20L (2062 kg/ha) and FLIP92-28L with the mean yield of 2011 kg/ha and ranking of 1, 2, 3, 4, and 5 respectively. In comparison to local check (1558 kg/ha) these lines have produced 44%, 36%, 35%, 32%, and 29 % more yield respectively with no significance differences in their mean yield.

Table 12 (Annex 6) summarizes the data on lentils large seed trial which was conducted in Takhar province in 1996. It indicates that FLIP 95-20L with a mean yield of 3317 kg/ha was the highest yielding line followed by FLIP 88-10L (3132 kg/ha), FLIP 90-3L (2997 kg/ha), FLIP91-12L (2988 kg/ha) and FLIP92-15L (2945 kg/ha). Their yield ranking is 1, 2, 3, 4, and 5th respectively. In comparison to the local check, these lines produced 74%, 64%, 57%, 56%, and 54 % higher yield.

After analysis of the variance of the data of Lentil International cold Tolerance lines, 9 top yielding varieties which showed good tolerance to cold was selected as follows:

1. ILL323
2. ILL 465
3. ILL 468
4. ILL780
5. ILL857
6. ILL975
7. ILL1918
8. SLL
9. Sazak'91

They have been put in Lentil Preliminary Yield Trial in 1998 (LPYT) in Takhar province. It will be tested under irrigation and rainfed condition during 1998 crop season in Takhar Province for further test.

The Lentil International Yield Trial Large Seed (LIYT-L-97) data from Herat and Nangrahar were analyzed. Their yields and rank have been shown in Table 13, Annex 6. In Herat province the analysis of variance showed that, the highest yield (1498 kg/ha) has given by entry number 17 (FLIP95-22L) and ranked first. Entry number 16 (FLIP95-21L) with the mean yield of 1469 kg/ha, and entry 6 (FLIP88-10L) with the mean yield of 1331 kg/ha ranked 2nd and 3rd respectively. In comparing to local check, entries 17, 16 and 6 have produced 20% 18% and 7% more yield.

In Nangrahar province (Table 13, Annex 6), entry number 5 with the mean yield of 1447 kg/ha, entry number 8 with the mean yield of 1258 kg/ha, and the entry number 24 with the mean yield of 1227 kg/ha ranked 1,2, and 3 respectively. However there is no significant difference between the mean yield of entry number 5, 8, 10, and 24. These four lines produced significantly more yield than the rest. In comparison to local check they produced 76%, 53% , 49% and 42 % more yield. When the data of mean yields of both locations was combined, the result showed that FLIP 96-13L with the mean yield of 1291 kg/ha, FLIP 90-7L with the mean yield of 1216 kg/ha, FLIP 87-9L with the mean yield of 1199 kg/ha and entry SLL with the mean yield of 1051 kg/ha ranked 1, 2, 3, and 4 respectively. From these 25 entries the 10 highest yielding lines have been selected for Lentil National Yield Trial for further testing in 1998.

3. **Kauz** (JUP/BJY//URES) is a facultative bread wheat variety of Mexican origin with wide range of adaptability to lower elevations of Afghanistan. Its pedigree is CM7458-4y-1M-3Y-IM-3Y-08-OSY. It has amber grain color and white chaff color. Its response to stem rust is zero, to stripe and leaf rust is MR and R respectively. Its response to leaf blotch is scored at 3 on (0-9) scale. It is resistant to lodging and has a height of 86 cm. This line is named in Pakistan as "Bakhtawar-92", but in the FAO program kept the Mexican name of Kauz.

   It was selected and tested in preliminary wheat trial in 1994. Kauz has been tested from 1991-1997 in different trials. In 1995 it was tested in wheat trials in Takhar and Baghlan provinces. In 1996-97 It was tested in National Wheat Yield Trials in 6 locations representing 6 zones (Ghazni, Herat, Kandahar, Nangrahar, Balkh, and Takhar). The average number of days to maturity of this variety are 284 days in Ghazni, 199 in Herat, 182 in Kandahar, 176 in Nangrahar, 197 in Balkh and 203 in Takhar. The thousand Kernel weight of this line is 38 grams. The mean yield from 1991-97 in 34 location is 5.49 Mt./ha. In comparison to Pirsabak-85, the long term check it has produced 14% more yield (Table 5).

Description of New Improved Wheat Varieties Recommended for Release and Multiplication in Afghanistan

1. **ID8009994.W./VEE:** It is a facultative bread wheat with prostrate growth habit. Its cross number is SWM15134 and its pedigree is 2WM-OWM-OSE-1YC-OYC. Its origin is Mexico/Turkey. The testing of this lines started in 1992 in 1st FAWWON line 109, and in 2nd FAWWON as line 167 in Logar, Wardak, Baghlan and Paktia provinces by SCA and DACAAR under normal sowing date in the fall. In 1992-97 the mean yield from 21 locations was 6.08 Mt./ha. This is 26% more than the yield of Pirsabak-85 (Table 5). The number of days to heading from the first January in Baghlan wre 142, in Paktia 165. The days to maturity of this line from the first January Paktia were 206 days. This line was included in (3rd FAWWON#75) 1993-94 and tested in Logar, Wardak, Gardez, Nangrahar and Kunduz provinces of Afghanistan. These test areas represents both cold and mild winter locations. It has been selected and tested in preliminary wheat yield trial in 1994-95 and in national wheat yield trial in 1995-96 in Takhar, Baghlan and Balkh provinces. In 1996-97, it was tested in national wheat yield trial in six zones (Ghazni, Herat, Kandahar, Nangrahar, Balkh and Takhar) provinces of Afghanistan. The days of maturity of this line were 287, 207, 191, 181, 208 and 213 in these provinces respectively. Its 1000 kernel weight is 44 grams, its test weight is 75.3 kg/hl. It has 51 grains per spike. It is of medium maturity with average plant height of 98 cm. It is resistant to stripe and leaf rusts with a score of O-MR. The grain color is amber. It has medium size of grain. Th chaff color is white. The suggested name for this line is **"Gul-96"**.

2. **VEE # 7/OPATA** : This line was selected in 1991 from 152 lines that were sent from CIMMTY (line #50). It is a bread wheat line with erect growth habit and good agronomic ratings. It has been tested from 1992-97, in national wheat yield trials in different parts of Afghanistan. In 1996-97, it was tested in Ghazni, Herat, Kandahar, Nangrahar, Balkh and Takhar provinces of Afghanistan. In a national wheat yield trials, its number of days from planting to maturity were 281, 195, 172, 201 and 204 respectively. It has an average plant height of 99 cm. The grain color is amber and its chaff color is white. The thousands Kernel weight is 41 grams and has 60 grain per spike. Its response to stripe, leaf and stem rust is R, and it is resistant to bunt and

The two years and three locations data is summarized in Table 14, Annex 6. It showed that FLIP 95-20L with overall mean of 2173 kg/ha, FLIP 88-10L with the overall mean of 2051 kg/ha and FLIP 91-12L with the overall mean of 1977 kg/ha ranked 1, 2 and 3rd respectively. Compared to local check (1472 kg/ha) these lines produced 48%, 39% and 34% more yield.

The results of the Lentil International Yield Trial small Seed In Nangrahar and Herat provinces are summarized in Table 15, Annex 6. It shows that in Nangrahar there are no significant differences between the mean yields of the entry number 5, 7, , 8, 9, 12, 13, 14, 15, 17, 20 and 21 but, these lines are significantly higher yielding than the others. The highest yield is produced by entry number 20 (1180 kg/ha) followed by entry number 12 (1158 kg/ha) and entry number 14 (1089 kg/ha) with ranking of 1, 2, and 3 respectively. In comparison to local check these lines produced 88%, 85% and 61% more yield.

In Herat province, there are no significant differences between the mean yields of entries 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15 17, 19, 20, 21, 22, 23, 24 and 25. Their yields are significantly higher than the entry number 1, 9, 10, 16, and 18. The highest mean yield is produced by the entry number 21 (1176 kg/ha) followed by entry number 23 (1173 kg/ha) and entry number 17 (1169 kg/ha)with a ranking of 1,2 and 3rd respectively. In comparison to local check these entries have produced 24%, 24% and 23% more yield.

When data from the two locations was combined, the overall mean and rank showed that entry number 20 (FLIP 95-42L) with the mean yield of 1139 kg/ha, entry number 14 (FLIP-95-34 L) with the mean yield of 1106 kg/ha, entry number 21 (FLIP 95-49L), with the mean yield of 1064 kg/ha and entry number 12 (FLIP95-32L) with the man yield of 1040 kg/ha and ranked 1, 2, 3 and 4th respectively. From this trial entry number 6, 8, 12, 13, 14, 17, 20, 21 and 23 have been selected for lentil preliminary Yield trial in 1998 crop season.

The data of 2 years and 3 locations is summarized in Table 16, Annex 6. The highest yield was given by the entry FLIP 92-19L(1591 kg/ha) followed by FLIP 92-28L (1495 kg/ha), FLIP 90-41L (1405 kg/ha), and FLIP 89-20L (1379 kg/ha) with the ranking of 1, 2, 3, and 4th respectively. Compared to local check (1173 kg/ha), these lines produced 36%, 27%, 20% and 18 % more yield.

Data of 10 lentil varieties that were tested in National Lentils Yield Trial in Nangrahar and Herat provinces under irrigated condition and in Takhar province under both irrigated and rainfed condition is been summarized in Table 17, Annex 6.

In Takhar province under irrigated condition the highest yield was recorded for FLIP 92-15L. However it is not significantly higher than the entry 78S 26002, FLIP88-10L and entry FLIP 95-22L. They produced 3447, 3317, 3254 and 3117 kg/ha and ranked 1, 2, 3 and 4 respectively. The local check produced a mean yield of 2252 kg/ha. Compared to local check these lines produced 53%, 47%, 44%, and 38% more yield.

In Takhar under rainfed condition, the highest yield was produced by the entry No.9 (FLIP 95-27L) with the mean yield of 1220 kg/ha . But it is not significantly higher than the yield of entry No. 5 (FLIP 92-15L) with a mean yield of 1150 kg/ha, entry No. 7 (FLIP 95-20L) with a mean yield of 1065 kg/ha and entry No. 1 (78S 26002) with a mean yield of 1044 kg/ha. These lines ranked 1, 2, 3 and 4 respectively. The local check produced a mean yield of 937 kg/ha. Compared to local check these lines produced 30%, 23%, 14% and 11% more yield.

In Balk Province there is not significantly differences between the main yield of the entry number 5, 6, 7, and 8. They have given significantly higher yields than the rest of the entries. The highest mean yield was produced by FLIP 92-15L (715 kg/ha), followed by FLIP 95-22L

(679 kg/ha), FLIP 95-20L (627 kg/ha), and FLIP 93-30L (560 kg/ha). These lines ranked 1, 2, 3 and 4 respectively. The local entry has produced the mean yield of 29 kg/ha.

In Herat province entry No. 1 (78S26002) produced a mean yield of 1297 kg/ha. This is not significantly different from the mean yield of entry number 9 (FLIP 95-27L) which is 1072 kg/ha. These two lines produced significantly higher yield than all other entries. The local check has produced a mean yield of 777 kg/ha. Compared to local check the lines, 78S 26002 and FLIP 95-27L produced 67% and 38% more yield.

In Nangrahar province the highest yield was recorded for the local check (2315 kg/ha) and it is not significantly different from the mean yield of entry 2 (FLIP88-10L) with the yield of 1912 Kg/ha and entry 1 (78S 26002) with the yield of 1792 kg/ha (Table 17, Annex 6). Similarly the mean yield of the entry number 2 is not significantly different from the mean yield of the entry 4, 5, 6, 7 and 8.

When the data of the National Lentil Yield Trial was combined , the overall mean yield and rank showed that the five top yielding entries are 78S 26002 (1551 kg/ha), FLIP 92 15L (1530 kg/ha), FLIP 95-22L (1478 kg/ha), FLIP 88 -10L (1474 kg/ha) and FLIP 95-27L (1393 kg/ha) with the ranking of 1 2, 3, 4, and 5 respectively. These entries are selected for Lentil National Yield Trial for 1998. The local check yielded 1262 kg/ha and ranked 9. Compare to local check, the five top yielding lines produced 23%, 21%, 17%, 17%, and 10% more yield.

Annex
Pulses
Tables (1-17)

Table 1. Mean yield (kg/ha) and rank of 10 bean varieties tested in Wardak province in 1996.

No.	Name	Yield/kg/ha	Rank
1	NW-63	2150	5
2	5229 UI	2631	1
3	Arapaho	2509	3
4	Othello	2247	4
5	Olathe	1984	6
6	CO-1760	2628	2
7	UI-59	1579	8
8	G89003	1819	7
9	6315-UI	1442	9
10	Local	1181	10
LSD at 5 %		947	
CV %		32.35	
Grand mean		2017	

Table 2. Mean yield (kg/ha), overall mean yield, number of years, number of test locations and rank of 14 top yielding varieties of bean tested druing 1992-95.

No.	Name of the Variety	No. of Year	No. of Location	Overall Mean	Rank
1	NW-63	3	5	2762	6
2	Arapaho	4	6	2918	3
3	Othe110	4	9	2269	10
4	Olathe	4	6	2776	5
5	CO-1760	4	7	2514	8
6	UI-59	4	9	2030	12
7	G89003	3	6	2046	11
8	6315-UI	4	7	2008	13
9	5229-UI	3	5	2933	2
10	Local	4	10	1964	14
11	CO 5241	4	5	2711	7
12	UI-114	3	5	2460	9
13	Viva	3	6	3445	1
14	55037UI	2	4	2780	4

Table 3. Mean yield (kg/ha), overall mean yield and rank of 10 bean varieties tested in 5 locations in Afghanistan during 1997.

No	Name or Pedigree	Nangrahar		Herat		Ghazni		Wardak		Takhar		Overall mean	
		Yield	Rank	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R
1	NW-63	2075	9	490	3	858	3	581	6	565	5	914	8
2	5229 UI	3189	5	512	2	1068	1	878	2	1043	2	1338	1
3	ARAPAHO	3584	2	330	5	750	7	978	1	488	7	1226	3
4	OTHELLO	3363	4	431	4	858	4	789	4	409	8	1170	4
5	OLATHE	3506	3	185	7	916	2	797	3	151	10	1111	6
6	CO 1760	3652	1	143	8	800	6	514	7	491	6	1120	5
7	UI-59	2652	7	308	6	837	5	353	9	644	3	959	7
8	G89003	2448	8	104	10	635	9	268	10	615	4	814	9
9	6315-UI	1798	10	126	9	687	8	656	5	187	9	691	10
10	LOCAL	3016	6	529	1	170	10	393	8	2347	1	1291	2
	LSD at 5%	1138		193		192		187		312			
	CV%	26.81		42.04		17.43		20.82		30.93			
	Grand mean	2928		316		758		621		694			

Table 4. Mean yield (kg/ha), number of locations (Loc.) and overall mean yield and rank of 10 bean lines tested in multilocation trials in Afghanistan during 1992-97.

No	Name or Pedigree	1992-95		1996		1997		1992-97 overall		
		Loc.	Yield	Loc.	Yield	Loc.	Yield	Loc.	Mean	Rank
1	NW-63	5	2762	1	2150	5	914	11	1942	5
2	5229 UI	5	2933	1	2631	5	1338	11	2301	1
3	ARAPAHO	6	2918	1	2509	5	1226	12	2218	2
4	OTHELO	9	2269	1	2247	5	1170	15	1895	6
5	OLATHE	6	2776	1	1984	5	1111	12	1957	4
6	CO 1760	7	2514	1	2628	5	1120	13	2087	3
7	UI-59	9	2030	1	1597	5	959	15	1529	8
8	G89003	6	2046	1	1819	5	814	12	1560	7
9	6315-UI	7	2008	1	1442	5	691	13	1380	10
10	LOCAL	10	1964	1	1181	5	1291	16	1479	9

Table 5. The mean yield (kg/ha), rank and overall mean of 7 chickpea varieties tested in Balkh province in 1993 and in Baghlan in 1995 under irrigated (IR) and rainfed conditions (RF.).

		Balkh		Baghlan 1995				overall	
No	Name or Pedigree	Yield	Rank	IR. Yield	Rank	RF. Yield	Rank	Mean	Rank
1	ILC-482	978	3	1152	3	518	3	882	2
2	FLIP81-923C	1948	1	1003	5	343	5	1098	1
3	FLIP82-150C	1289	2	916	7	397	4	867	4
4	FLIP84-15C	952	4	1161	1	523	2	878	3
5	FLIP84-92C	594	6	1046	4	213	7	617	6
6	FLIP83-48C	633	5	961	6	340	6	644	5
7	LOCAL			1158	2	607	1	882	2
	LSD at P= 0.05			313					
	CV %			16.67					
	Grand mean	1066		1057		420		838	

Table 6. Mean yield (kg/ha) and rank of 24 chickpea lines tested in International Yield Trial Winter (Mediterranean region) in Takhar province during 1996.

No	Name or pedigree	Yield	Rank
1	FLIP91-52C	4442	9
2	FLIP91-58C	4306	12
3	FLIP91-60C	3558	23
4	FLIP91-61C	3912	20
5	FLIP91-63C	4367	11
6	FLIP91-149C	3510	24
7	FLIP91-219C	4265	13
8	FLIP91-220C	4626	7
9	FLIP91-222C	4630	6
10	FLIP92-40C	5014	2
11	FLIP92-155C	4415	10
12	FLIP92-162C	3925	19
13	FLIP92-164C	3714	22
14	FLIP92-169C	4918	3
15	FLIP93-38C	4218	14
16	FLIP93-93C	4701	5
17	FLIP93-128C	4088	17
18	FLIP93-146C	4041	18
19	FLIP93-174C	4177	15
20	FLIP93-181C	4735	4
21	FLIP93-186C	4177	16
22	FLIP82-150C	3857	21
23	ILC-482 (LONG TERM CHECK	5320	1
24	LOCAL CHECK	4456	8
	LSD at 5%	984	
	CV %	13.87	
	Grand mean		

Table 7. The Mean yield kg/ha. overall mean yield and rank of 10 chickpea lines tested in 3 locations in Afghanistan during 1996-97.

No	Name or pedigree	Takhar Yield	Takhar Rank	Balkh Yield	Balkh Rank	Herat Yield	Herat Rank	Takhar (RF) Yield	Takhar (RF) Rank	Overall mean Yield	Overall mean Rank
1	FLIP91-52C	3118	4	731	5	370	10	897	10	1279	7
2	FLIP91-63C	3007	7	560	9	551	4	935	9	1263	9
3	FLIP91-220C	3014	6	504	10	436	7	1133	4	1272	8
4	FLIP91-222C	2783	10	587	7	415	8	1052	7	1209	10
5	FLIP92-40C	3180	2	582	8	480	6	1142	2	1346	5
6	FLIP92-169C	2882	9	1093	1	389	9	1056	6	1355	4
7	FLIP93-93C	3292	1	782	4	576	3	1128	5	1445	2
8	FLIP93-181C	3175	3	633	6	484	5	1048	8	1335	6
9	ILC 482	3067	5	783	3	729	2	1140	3	1430	3
10	LOCAL CHECK	2937	8	799	2	882	1	1205	1	1456	1
	Location mean	3045		705		531		1074			
	C.V. %	9.2		44.4		29.3		15.8			
	LSD at P = 0.05	406		454		226		247			

septoria. It has high yield potential. Its mean yield from 1992-97 in 21 locations is 5.51 Mt./ha (Table 5). In comparison to Pirsabak-85 it has given 14% more yield. The suggested name for this line is **"Takhar-96"**.

3. **Bloundan/3/Bb/7C*2//Y50E/Kal*3**: It is a bread wheat line with white grain and white chaff color. It has erect to semi-erect growth habit with a mean plant height of 94 cm and a 1000 kernel weight of 42 grams. It was tested in Afghanistan in 1994 and 1995 in the Regional Bread Wheat Yield Trial for favorable environment from ICARDA. It was also included in National Wheat Yield Trials in 1995 in Baghlan and Takhar provinces and in a CIMMYT Elite Wheat Yield Trial in Baghlan. 1996 crop season this line was tested nation wide in six locations (Ghazni, Herat, Kandahar, Nangrahar, Balkh and Takhar provinces). The average number of days to maturity of this line are 286, 191, 179, 208, and 209 days in these provinces respectively. The stripe rust reaction of this line is 0-R and with a score of 3 for leaf blotch (0-9 scale). It has shown resistance to bunt and smut diseases. Its mean yield (1994-1997) over 16 locations in Afghanistan is 5.27 Mt./ha (Table 5) which is 9% higher than Pirsabak-85 (4.82 Mt./ha) the long term check over 40 locations. The suggested name for this line is **"Roshan-96"**.

4. **CA8055/6/PATO®/CAL/3/76//BB/CN015/CAL//CNO/SN64/4/CNO//NAD/CH**: It is a facultative bread wheat. The growth habit is prostrate to semi erect and its origin is Syria. The cross number is ICWH 840431 and its pedigree is 2AP-2AP-2AP-1AP-0AP. It was introduced in the 1st FAWWON in 1991-92 to Afghanistan and planted in Logar, Baghlan, and Paktia (Jaji) by SCA. It has been tested in replicated trial from 1991-97. In 1996-97 it was tested in a national wheat yield trials in Wardak, Herat, Balkh, Takhar, Ghazni and Logar provinces of Afghanistan. The days to maturity of this line in these locations are 268, 199, 205, 208, 284 and 269 respectively. Its response to stripe rust is (O-R) and to leaf rust it is MS. Its average plant height is 95 cm. Its grain color is white and its agronomy rating is 4. Its test weight is 75 kg/hl, and its average thousand grain weight is 43.5 g. The average yield from 1991-97 in 22 locations is 5.49 Mt./ha (Table 5). In comparison to Pirsabak-85, it has given 14% more yield over years and locations. It has about 16.5% protein. The name **"Rana-96"** has been suggested for this line.

5. **PRL"s"/PEW** (CM59377-3AP-1AP-3AP-2AP-1AP-0AP): This is a bread wheat line that has performed well under arid conditions. This lines has been tested in Afghanistan since 1990-91 crop season in Regional Bread Wheat Yield Trial for Low rain fall areas (RBWYT-LRA90-91#15). Its origin is Mexico/Syria. Since that time it has been included in rainfed wheat yield trials in Takhar, Baghlan and Balkh provinces. In 1996-97 crop season it was tested in two location in Herat, one location each in Balkh and Takhar provinces under rainfed conditions. The stripe rust reaction of this line is scored 0-MR and its leaf rust reaction is R. The average maturity days of this line in two locations in Herat were175 days, while in Takhar and Baghlan it matured in 113 days. It has amber grain color lines and has yielded 1.58 Mt./ha (Table 5) in 1992-1997) in 11 locations. It has a protein content of 13 %. This line is being considered for release under rainfed conditions. The name **"Ghori-96"** is suggested for this line.

6. **HD2206/HORK//BUC/BUL**: This is a good line that is suitable for rainfed conditions in Afghanistan. This line was included in the `52 lines sent by CIMMYT to SCA in 1990-91 (line # 27). It has been tested since 1992 in a number of trials

Table 8. The mean yield kg/ha, overall mean yield and rank of 10 chickpea varieties tested in preliminary chickpea yield trial in 3 locations of Afghanistan during 1996-97.

No	Name or pedigree	Takhar		Herat		Balkh		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	FLIP93-78C	1861	6	504	4	574	7	980	6
2	FLIP93-106C	1611	10	406	7	760	2	926	8
3	FLIP93-147C	2411	2	349	9	705	4	1155	4
4	FLIP93-148C	2909	1	556	3	812	1	1426	1
5	FLIP94-3C	1750	8	393	8	480	10	874	10
6	FLIP94-30C	1729	9	448	6	509	8	895	9
7	FLIP94-47C	2090	5	299	10	662	5	1017	5
8	FLIP94-70C	2142	4	1012	1	724	3	1293	2
9	FLIP94-92C	1837	7	497	5	593	6	976	7
10	LOCAL CHECK	2233	3	988	2	482	9	1234	3
	Grand mean	2061		545		630		1078	
	C.V. %	19.9		27.3		32			
	LSD at P= 0.05	597		216		294			

Table 9. Mean yield kg/ha, overall mean and rank of 64 lines of chickpea International Screening Nursery-Winter tested in two locations in Afghanistan during 1996-97.

No	Name	Takhar		Ghazni		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank
1	FLIP 94-2C	2528	12	143	58	1336	20
2	FLIP 94-3C	1967	37	186	51	1077	46
3	FLIP 94-6C	2250	23	320	24	1285	25
4	FLIP 94-11C	2467	13	194	49	1331	21
5	FLIP 94-17C	1806	50	400	14	1103	42
6	FLIP 94-19C	2639	9	129	59	1384	13
7	FLIP 94-20C	1611	61	68	64	840	63
8	FLIP 94-23C	2161	28	314	25	1238	29
9	FLIP 94-29C	1889	43	429	13	1159	36
10	FLIP 94-30C	1867	45	100	62	984	58
11	FLIP 94-32C	2194	26	514	8	1354	17
12	FLIP 94-43C	2014	35	371	17	1193	31
13	FLIP 94-45C	1778	52	191	50	985	57
14	FLIP 94-46C	1833	48	457	12	1145	39
15	FLIP 94-47C	2160	29	526	7	1343	19
16	FLIP 94-49C	2417	17	286	31	1352	18
17	FLIP 94-50C	2872	3	300	28	1586	5
18	FLIP 94-70C	1708	57	229	39	969	59
19	FLIP 94-92C	2339	19	217	44	1278	26
20	FLIP 94-97C	1653	60	329	21	991	56
21	FLIP 94-110C	1939	41	394	16	1167	35
22	FLIP 94-123C	1714	56	171	53	943	60
23	S 95088	2075	33	229	40	1152	37
24	S 95099	1708	58	329	22	1019	51
25	S 95175	1917	42	171	54	1044	47
26	S 95181	1861	46	334	20	1098	43
27	S 95210	2300	21	589	5	1445	10
28	S 95215	2103	31	629	3	1366	15
29	S 95217	2422	16	308	26	1365	16
30	S 95243	3260	1	400	15	1830	2
31	S 95249	1472	63	300	29	886	62
32	S 95252	1747	55	303	27	1025	50

Table 9 continue. Mean yield kg/ha, overall mean and rank of 64 lines of chickpea International Screening Nursery-Winter tested in two locations in Afghanistan during 1996-97.

No	Name	Takhar		Ghazni		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank
33	S 95254	1750	54	471	11	1111	41
34	S 95257	1861	47	209	46	1035	49
35	S 95274	2022	34	271	34	1147	38
36	S 95287	2928	2	586	6	1757	3
37	S 95290	2179	27	171	55	1175	34
38	S 95293	2444	15	186	52	1315	24
39	S 95306	1775	53	231	38	1003	55
40	S 95312	2583	10	200	47	1392	12
41	S 95313	1806	51	223	42	1015	52
42	S 95324	1944	38	69	63	1007	54
43	S 95325	2772	7	149	57	1461	9
44	S 95332	2142	30	214	45	1178	33
45	S 95333	2361	18	477	10	1419	11
46	S 95336	2856	5	857	1	1857	1
47	S 95342	1667	59	166	56	917	61
48	S 95343	2867	4	351	19	1609	4
49	S 95345	2306	20	329	23	1318	23
50	S 95346	2458	14	300	30	1379	14
51	S 95347	2217	25	220	43	1219	30
52	S 95348	2250	24	277	33	1264	27
53	S 95351	1986	36	506	9	1246	28
54	S 95377	2083	32	286	32	1185	32
55	S 95379	2778	6	226	41	1502	7
56	S 95391	1811	49	266	35	1039	48
57	S 95393	1944	39	243	37	1094	45
58	S 95412	1889	44	128	60	1009	53
59	S 95424	2569	11	594	4	1582	6
60	S 95428	2722	8	200	48	1461	8
61	S 95429	1944	40	246	36	1095	44
62	FLIP 82-150C	1278	64	114	61	696	64
63	ILC 482	2283	22	363	18	1323	22
64	LOCAL CHECK	1583	62	671	2	1127	40
	LSD at P= 0.05	2137		307			
	C.V. %	23.1		46.3			
	Grand mean	987		284			

Table 10. The mean yield kg/ha, overall mean and rank of 64 lines of chickpea International Screening-Spring tested in 3 locations in Afghanistan during 1997.

No	Name	Takhar		Ghazni		Balkh		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	FLIP 93-21C	2108	52	989	5	619	39	1239	40
2	FLIP 93-79C	2461	36	457	50	983	22	1300	30
3	FLIP 94-1C	2356	43	843	9	1539	7	1579	6
4	FLIP 94-10C	2328	45	309	61	747	33	1128	54
5	FLIP 94-13C	2511	31	660	23	686	35	1286	34
6	FLIP 94-22C	2756	19	380	56	1356	11	1497	14
7	FLIP 94-25C	3261	1	1197	2	192	58	1550	7
8	FLIP 94-27C	2783	14	463	49	1328	13	1525	11
9	FLIP 94-39C	2853	8	840	10	828	31	1507	13
10	FLIP 94-40C	3233	2	629	30	1156	15	1673	3
11	FLIP 94-41C	2356	44	280	63	361	53	999	58
12	FLIP 94-42C	2794	13	466	48	1389	10	1550	8
13	FLIP 94-44C	2244	48	834	11	797	32	1292	33
14	FLIP 94-52C	2969	6	505	44	836	30	1437	19
15	FLIP 94-54C	2781	15	614	32	408	50	1268	37
16	FLIP 94-56C	2600	25	740	17	150	60	1163	51
17	FLIP 94-64C	2822	11	911	7	839	29	1524	12
18	FLIP 94-84C	2681	23	586	34	939	25	1402	23
19	FLIP 94-89C	2038	54	637	27	367	52	1014	57
20	FLIP 94-99C	1639	64	651	24	233	57	841	63
21	FLIP 94-100C	1761	61	1143	3	994	21	1299	31
22	FLIP 94-109C	2319	47	426	54	1892	1	1546	9
23	FLIP 94-114C	2833	9	746	16	1708	3	1762	1
24	S 95082	2769	17	774	13	850	28	1464	16
25	S 95090	1814	59	343	59	164	59	774	64
26	S 95106	2222	49	749	15	1050	17	1340	27
27	S 95176	2761	18	580	36	733	34	1358	26
28	S 95184	2114	51	511	42	253	56	959	61
29	S 95188	2872	7	709	20	592	41	1391	25
30	S 95191	2986	5	480	46	267	55	1244	38
31	S 95192	1961	57	931	6	958	24	1283	35
32	S 95196	1969	56	254	64	1200	14	1141	53

Table 10 continue. Mean yield kg/ha, overall mean and rank of 64 lines of chickpea International Screening-Spring tested in 3 locations in Afghanistan during 1997.

No	Name	Takhar		Ghazni		Balkh		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
33	S 95197	2133	50	440	53	103	64	892	62
34	S 95203	2703	22	560	38	558	43	1274	36
35	S 95204	2003	55	586	35	380	51	990	60
36	S 95234	1728	63	360	57	1500	8	1196	48
37	S 95235	2831	10	303	62	500	47	1211	44
38	S 95236	2328	46	651	25	1764	2	1581	5
39	S 95238	2742	20	549	39	347	54	1213	43
40	S 95246	2417	40	729	19	531	45	1226	42
41	S 95247	1739	62	1286	1	658	36	1228	41
42	S 95272	2422	39	314	60	886	27	1207	45
43	S 95273	2583	27	357	58	1681	4	1540	10
44	S 95277	2497	34	489	45	536	44	1174	50
45	S 95280	2489	35	757	14	1019	19	1422	22
46	S 95281	2558	28	549	40	483	48	1197	47
47	S 95296	2450	37	806	12	1019	20	1425	21
48	S 95302	2775	16	631	29	964	23	1457	17
49	S 95304	2653	24	591	33	642	38	1295	32
50	S 95307	3125	4	680	22	505	46	1437	20
51	S 95321	3136	3	417	55	456	49	1336	28
52	S 95328	2106	53	706	21	1156	16	1323	29
53	S 95330	2358	42	469	47	894	26	1240	39
54	S 95331	2589	26	457	51	117	62	1054	56
55	S 95335	2814	12	634	28	1544	6	1664	4
56	S 95338	2439	38	1109	4	1672	5	1740	2
57	S 95372	2533	29	449	52	1333	12	1438	18
58	S 95373	2508	32	509	43	1444	9	1487	15
59	S 95374	2506	33	651	26	1042	18	1400	24
60	S 95419	2728	21	734	18	117	63	1193	49
61	S 95439	2403	41	571	37	617	40	1197	46
62	FLIP 82-150C	1806	60	629	31	561	42	999	59
63	ILC 482	1881	58	906	8	656	37	1148	52
64	LOCAL CHECK	2517	30	540	41	122	61	1060	55
	LSD at P= 0.05	2476		626		816			
	C.V. %	21		32		74			
	Grand mean	1026		401		1214			

Table 11. The mean yield in kg/ha and rank of 24 lentil varieties tested in Lentil International Yield Trial Small Seeded in Nangarhar province in 1996.

NO.	Name Of Pedigree	Yield	Rank
1	SLS	1393	19
2	81S 15	1667	11
3	FLIP 89-20L	1836	8
4	FLIP89-31L	1822	9
5	FLIP89-39L	1562	14
6	FLIP90-22L	2111	3
7	FLIP90-36L	1307	21
8	FLIP90-41L	1920	6
9	FLIP 92-19L	2256	1
10	FLIP 92-20L	2062	4
11	FLIP 92-27L	1862	7
12	FLIP 92-28L	2011	5
13	FLIP 92-36L	2113	2
14	FLIP 92-37L	1480	17
15	FLIP93-IL	1520	16
16	FLIP93-7L	1589	13
17	FLIP95-30L	1147	22
18	FLIP95-31L	1631	12
19	FLIP95-321	1100	23
20	FLIP95-33L	856	24
21	FLIP95-34L	1429	18
22	FLIP95-36L	1378	20
23	FLIP95-38L	1771	10
24	Local Check	1558	15
	LSD at P= 0.05	760	
	C.V. %	28.19	
	Grand mean	1641	

Table 12. Mean yield in kg/ha and rank of 24 lentil varieties tested in Lentil International Yield Trial Large (LIYTL) seeded in Takhar province in 1996.

NO.	Name Of Pedigree	Yield	Rank
1	SLS	2698	13
2	78S 26002	2873	9
3	FLIP84-78L	1792	22
4	FLIP84-149L		
5	FLIP86-51L	2100	20
6	FLIP86-56L	1652	23
7	FLIP87-9L	2605	18
8	FLIP88-10L	3132	2
9	FLIP 90-3L	2997	3
10	FLIP 90-7L	2663	15
11	FLIP 91-12L	2988	4
12	FLIP 92-3L	2702	12
13	FLIP 92-15L	2945	5
14	FLIP 92-48L	2778	10
15	FLIP93-30L	2893	7
16	FLIP95-13L	2740	11
17	FLIP95-14L	2463	19
18	FLIP95-15L	2698	14
19	FLIP95-17L	2660	16
20	FLIP95-20L	3317	1
21	FLIP95-21L	2618	17
22	FLIP95-22L	2877	8
23	FLIP95-27L	2907	6
24	Local Check	1910	21

Table 13. Mean yield in kg/ha, overall mean yield and rank of 25 lentil varieties tested in Lentil International Yield Trial Large (LIYTL) seeded in 2 locations during 1997.

No	Name	Herat		Nangrahar		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank
1	SLL	1171	11	931	9	1051	4
2	78S 26002	1191	8	386	24	789	24
3	FLIP 84-149L	1013	21	1000	7	1007	11
4	FLIP 86-51L	1031	20	860	10	946	17
5	FLIP 87-9L	951	23	1447	1	1199	3
6	FLIP 88-10L	1331	3	609	20	970	15
7	FLIP 90-3L	1160	12	676	18	918	19
8	FLIP 90-7L	1173	10	1258	2	1216	2
9	FLIP 91-12L	1136	13	793	13	965	16
10	FLIP 92-3L	929	24	1171	4	1050	5
11	FLIP 93-30L	1113	16	620	19	867	22
12	FLIP 95-13L	1087	18	771	14	929	18
13	FLIP 95-15L	1131	14	684	17	908	20
14	FLIP 95-17L	1131	15	949	8	1040	7
15	FLIP 95-20L	1302	4	753	15	1028	9
16	FLIP 95-21L	1469	2	573	21	1021	10
17	FLIP 95-22L	1498	1	273	25	886	21
18	FLIP 96-2L	1204	7	749	16	977	14
19	FLIP 96-3L	927	25	1158	5	1043	6
20	FLIP 96-4L	1100	17	496	22	798	23
21	FLIP 96-8L	1189	9	802	12	996	12
22	FLIP 96-9L	964	22	1002	6	983	13
23	FLIP 96-11L	1042	19	482	23	762	25
24	FLIP 96-13L	1211	6	1227	3	1219	1
25	LOCAL	1244	5	824	11	1034	8
	Grand mean	1148		819			
	C. V. %	18.4		21.4			
	LSD at P= 0.05	347		288			

Table 14. Mean yields (kg/ha), number of locations, overall mean yeild and rank of 31 large seeded lentil lines tested in 3 locations during 1996 and 1997.

No	Name	1996		1997		No. of	Overall	Rank	
		Locations	Yield	Locations	Yield	Locations	Mean	A	B
1	SLL	1	2698	2	1051	3	1875	10	
2	78S26002	1	2873	2	789	3	1831	13	
3	FLIP84-78L	1	1792			1	1792	16	
4	FLIP84-149L			2	1007	2	1007		3
5	FLIP86-51L	1	2100	2	946	3	1523	17	
6	FLIP86-56L	1	1652			1	1652		
7	FLIP87-9L	1	2605	2	1199	3	1902	6	
8	FLIP88-10L	1	3132	2	970	3	2051	2	
9	FLIP90-3L	1	2997	2	918	3	1958	4	
10	FLIP90-7L	1	2663	2	1216	3	1940	5	
11	FLIP91-12L	1	2988	2	965	3	1977	3	
12	FLIP92-3L	1	2702	2	1050	3	1876	9	
13	FLIP92-15L	1	2945			1	2945		
14	FLIP92-48L	1	2778			1	2778		
15	FLIP93-30L	1	2893	2	867	3	1880	8	
16	FLIP95-13L	1	2740	2	929	3	1835	12	
17	FLIP95-14L	1	2463			1	2463		
18	FLIP95-15L	1	2698	2	908	3	1803	15	
19	FLIP95-17L	1	2660	2	1040	3	1850	11	
20	FLIP95-20L	1	3317	2	1028	3	2173	1	
21	FLIP95-21L	1	2618	2	1021	3	1820	14	
22	FLIP95-22L	1	2877	2	886	3	1882	7	
23	FLIP95-27L	1	2909			1	2909		
24	FLIP96-2L			2	977	2	977		4
25	FLIP96-3L			2	1043	2	1043		2
26	FLIP96-4L			2	798	2	798		7
27	FLIP96-8L			2	996	2	996		5
28	FLIP96-9L			2	983	2	983		6
29	FLIP96-11L			2	762	2	762		8
30	FLIP96-13L			2	1219	2	1219		1
31	Local Check	1	1910	2	1034	3	1472	18	

Rank A = Rank of 3 Locations and 2 Years.
Rank B = Rank of 2 locations and 1 year.

Table 15. Mean yield in kg/ha, overall mean yield and rank of 25 lentil varieties tested in Lentil International Yield Trial Small Seeded in 2 locations in 1996-97.

No	Name	Nangrahar		Herat		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank
1	SLS	531	23	740	24	636	25
2	81S 15	684	19	1104	9	894	15
3	FLIP 89-20L	753	15	1089	11	921	12
4	FLIP 90-41L	747	16	1031	12	889	17
5	FLIP 92-19L	893	9	956	16	925	11
6	FLIP 92-28L	809	14	1149	4	979	9
7	ILL 7213	889	10	933	19	911	14
8	FLIP 93-1L	898	8	1129	5	1014	7
9	FLIP 93-7L	1011	4	724	25	868	18
10	FLIP 95-30L	456	25	836	21	646	24
11	FLIP 95-31L	842	12	993	13	918	13
12	FLIP 95-32L	1158	2	922	20	1040	4
13	FLIP 95-33L	922	7	1113	7	1018	6
14	FLIP 95-34L	1089	3	1122	6	1106	2
15	FLIP 95-36L	936	6	987	14	962	10
16	FLIP 95-38L	704	18	809	22	757	21
17	FLIP 95-39L	878	11	1169	3	1024	5
18	FLIP 95-40L	591	22	747	23	669	23
19	FLIP 95-41L	707	17	951	17	829	19
20	FLIP 95-42L	1180	1	1098	10	1139	1
21	FLIP 95-49L	951	5	1176	1	1064	3
22	FLIP 95-55L	673	20	1113	8	893	16
23	FLIP 95-57L	809	13	1173	2	991	8
24	FLIP 95-58L	513	24	969	15	741	22
25	LOCAL	627	21	949	18	788	20
	Grand mean	810		999			
	C. V. %	23.7		17.7			
	LSD at P= 0.05	315		290			

both under rainfed and irrigated conditions. In 1995 and 1996 it was tested in rainfed wheat yield trials. The average yield of this line over years (1992-1997) and locations (11) has been 1.48 Mt./ha (Table 5). It is resistant to stripe, stem and leaf rusts. Its number of days to maturity varies from 175 days in Herat to 113 days in Baghlan and Takhar. It is an early lines and if planted earlier than other varieties, it will receive bird damage. It has amber color and weighs 35 gram per 1000 grains. The word **"DAYMA-96"** which stands for rainfed has been suggested for this line.

Description of High Yielding Wheat Genotypes that Needs Further Evaluation

1. **BLL/SERI**: It is a facultative bread wheat that originated in Mexico. Its cross number is SWM17290 and its pedigree is -SE-0YC-3YC-0YC. It was included in the 3rd FAWWON#64 in 1993-94 where it was tested in Logar, Wardak, Gardez, Nangrahar and Kunduz provinces in Afghanistan by SCA. Its days to heading from the 1st of January were 137, 136, 151, 125 and 111 days respectively. Based on its high yielding ability, it was selected and included in the preliminary yield trial in 1994-95 crop season for further evaluation in Nangrahar, Takhar, and Ghazni provinces. In 1995-96 crop season it was included in the advanced wheat yield trial in Takhar, Baghlan and Balkh provinces. In 1996-97 crop season it was included in a national wheat yield trial and tested in six locations (Ghazni, Herat, Kandahar, Takhar, Balkh and Nangrahar provinces) in the country. Its days to maturity are 284, 202, 185, 178, 203, and 210 days respectively. The reaction of this line to the existing races of stripe rust is 5MR, to leaf rust it is 0-MR and to stem rust its response is 0-R. It has an average height of 97 cm with a red grain and white chaff color. The 1000 kernel weight of this line is 44 gram. It has 47 kernels per spike. Its mean yield over 19 locations is 5.76 Mt./ha (1993-1997) which is 20% higher than Pirsabak-85, the long term check (Table 5).
2. **K2340/SX//MT/GB/3/K340/FR/4/PI"S"/KT54/NAR"S"**: It is a facultative bread wheat with a prostrate growth habit. Its origin is Mexico. It has been tested from 1994 in national wheat trials in 3 locations of Afghanistan. In 1996-97 it has been put in national wheat yield trials in Ghazni, Herat, Kandahar, Nangrahar, Balkh and Takhar provinces of Afghanistan. It was tested in Herat in advanced wheat yield trial in 1996-97. The days to maturity of this lines from planting are 288, 212,193, 180, 212 and 220 respectively in the above mentioned provinces. Its response to stripe rust is R and to leaf rust is MR to MS. It is resistant to bunt, smut, septoria and susceptible to leaf blotch. Its chaff and grain color is white. Its average plant height is 97 cm. Its mean yield in 14 locations is 6.12 Mt./ha (Table 5) over four years (1994-97). Compared to Pirsabak-85 it has produced 27% more yield.
3. **ANZA/KATYA AI**: is a facultative bread wheat that has semi-erect to prostrate growth habit . Its origin is Syria. Its cross number is ICWH830667 and its pedigree is -1AP-3AP-1AP-OAP. It was included in the 2nd FAWWON in 1992-1993 lines #168. In 1994-95 and 1995-96 crop season it was included in national wheat yield trial in Takhar, Baghlan, and Balkh provinces. In 1996-97 it was tested in national wheat yield trials in six locations (Ghazni, Herat, Kandahar, Nangrahar, Balkh and Takhar). The numbers of days to maturity of this line were 283, 198, 187, 178, 204 and 203 respectively. It has amber grain color and white chaff color. It has good agronomic ratings and a plant height of 95 cm. It has 59 grain/spike and its thousand Kernel weight is 45 grams. The response of this lines to leaf rust is MR and to stripe

Table 16. Mean yield (kg/ha), number of locations, overall mean yield and rank of 32 small seeded lentil lines tested in Lentil Small Seeded Trial in 1996 and 1997.

No	Name	1996		1997			Overall	Rank	
		Locations	Yield	Locations	Yield	Locations	Mean	A	B
1	SLS	1	1393	2	636	3	1015	14	
2	81S15	1	1667	2	894	3	1281	6	
3	FLIP89 20L	1	1836	2	921	3	1379	4	
4	FLIP89 31L	1	1822			1	1822		
5	FLIP89 39L	1	1562			1	1562		
6	FLIP90 22L	1	2111			1	2111		
7	FLIP90 36L	1	1307			1	1307		
8	FLIP90 41L	1	1920	2	889	3	1405	3	
9	FLIP92 19L	1	2256	2	925	3	1591	1	
10	FLIP92 20L	1	2062			1	2062		
11	FLIP92 27L	1	1862			1	1862		
12	FLIP92 28L	1	2011	2	979	3	1495	2	
13	FLIP92 136L	1	2113			1	2113		
14	FLIP92 37L	1	1480			1	1480		
15	FLIP93 1L	1	1520	2	1014	3	1267	8	
16	FLIP93 7L	1	1589	2	868	3	1229	10	
17	FLIP95 30L	1	1147	2	646	1	897	16	
18	FLIP95 31L	1	1631	2	918	3	1275	7	
19	FLIP95 32L	1	1100	2	1040	3	1070	13	
20	FLIP95 33L	1	856	2	1018	3	937	15	
21	FLIP95 34L	1	1492	2	1106	3	1299	5	
22	FLIP95 36L	1	1378	2	962	3	1170	12	
23	FLIP95 38L	1	1771	2	752	3	1262	9	
24	FLIP95 39L			2	1024	2	1024		3
25	FLIP95 40L			2	669	2	669		8
26	FLIP95 41L			2	829	2	829		6
27	FLIP95 42L			2	1139	2	1139		1
28	FLIP95 49L			2	1064	2	1064		2
29	FLIP95 55L			2	893	2	893		5
30	FLIP95 57L			2	991	2	991		4
31	FLIP95 58L			2	741	2	741		7
32	Local Check	1	1558	2	788	2	1173	11	

Rank A = Rank of 3 Locations and 2 years.
Rank B = Rank of 2 Locations and 1 year.

Table 17. The mean yield, overall mean yield, and rank of 10 lentil lines tested in National Lentils Yield Trial in 3 locations of Afghanistan under irrigated and rainfed conditions during 1996-97

No	Name or pedigree	Takhar (IR)		Takhar (RF)		Balkh		Herat		Nangrahar		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	78S 26002	3317	2	1044	4	306	8	1297	1	1792	3	1551.2	1
2	FLIP88-FOL	3254	3	941	8	359	7	902	4	1912	2	1473.6	4
3	FLIP90-3L	2777	9	900	10	247	9	563	10	1087	10	1114.8	10
4	FLIP91-12L	2900	7	977	6	382	6	622	9	1698	6	1315.8	8
5	FLIP92-15L	3447	1	1150	2	715	1	765	7	1572	7	1529.8	2
6	FLIP93-30L	2887	8	1003	5	560	4	740	8	1748	4	1387.6	7
7	FLIP95-20L	3042	5	1065	3	627	3	847	5	1375	8	1391.2	6
8	FLIP95-22L	3117	4	944	7	679	2	922	3	1728	5	1478	3
9	FLIP95-27L	3037	6	1220	1	430	5	1072	2	1205	9	1392.8	5
10	LOCAL	2252	10	937	9	29	10	777	6	2315	1	1262	9
	Location Meai	3003		1018		433		850		1643			
	C.V. %	8.6		12.8		34.5		25.5		22			
	LSD at P= 0.0	376		189		217		315		525			

List of Staff Working with Crop Improvement Project

1. Mr. Abdul Rahman Manan, NPPP, Peshawar, Pakistan
2. Mr. Abdul Ahad Ahad, Farm Foreman, Takhar, Afghanistan
3. Mr. Gul Agha, store keeper, Takhar, Afghanistan
4. Mr. Mohammed Ayoub, NPPP, Ghazni, Afghanistan
5. Mr. Sultan Hamid, Farm Foreman, Ghazni, Afghanistan
6. Mr. Hedayatullah, Farm Technician, Ghazni, Afghanistan
7. Mr. Mohamad Essa, Farm Foreman, Jalalabad, Afghanistan
8. Mr. Noorulhaq Hakimi, Farm Technician, Jalalabad, Afghanistan
9. Mr. Hafizullah Shinwari, Administrative assistant, Jalalabad, Afghanistan
10. Mr. Mohebullah Numan, store keeper, Jalalabad, Afghanistan
11. Mr. Shamsuddin Siddiqi, NPPP, Kandahar, Afghanistan
12. Mr. Asadullah Habibi, Farm Foreman, kandahar, Afghanistan
13. Mr. Ahmad Zia Aria, NPPP, Herat, Afghanistan
14. Mr. Khalilurahman, Farm Foreman, Herat, Afghanistan
15. Mr. Shah Sayed Aalimi, NPPP, Mazar-i-Sharif, Afghanistan
16. Mr. Mohamad Sawar, Farm Foreman, Mazar-i-Sharif, Afghanistan
17. Mr. Abdul Wahid, Farm Technician, Mazar-i-Sharif, Afghanistan
18. Mr. Shah Mohamad Mohaqiq, NPPP, Takhar, Afghanistan




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rust is R. It is resistant to septoria, bunt and smut. The average yield from 1993-97 over 15 locations is 5.88 Mt./ha (Table 5). In comparison to Pirsabak-85 it has given 22% more yield.

4. **F134-71/Crow"s"**: It is a facultative bread wheat with a prostrate growth habit. Its origin is Mexico/Syria. It was tested for the first time in 1991 Regional Bread Wheat Yield Trial Semi-Arid conditions (entry # 4). Its pedigree is SWM11147-1AP-2AP-4AP-1AP-0AP. After selection it has been tested in national wheat yield trials (1993-97). In 1996-97, it was put in yield trials for further testing and in small scale seed multiplication program in six locations (Ghazni, Herat, Kandahar, Nangrahar, Balkh and Takhar) in Afghanistan. The maturity days of this line differs from place to place in Afghanistan. It takes 297 days in Ghazni, Logar, Wardak and other cool areas. While it takes 197 in Herat, 187 in Kandahar, 178 in Nangrahar, 207 in Balkh and 211 days in Takhar provinces to mature. It is resistant to stripe rust and shows R response to leaf rust. Its leaf blotch score is 2-3 on (0-9) scale. It is also resistant to bunt and smut. Its grain color is light red and its mean plant height is 98 cm. Its thousand kernel weight is 32 grams. From 1994-97, its mean yield in 16 locations is 5.28 metric tons/ha. It gives 10% more yield than Pirsabak-85 (Table 5). It has a protein content of 12.6 %. The suggested name for this lines is **"Maiwand-97"**.
5. **AGRI/NAC**: It is a facultative bread wheat. The cross number is SWM06599 and pedigree is -02H-IH-3P-0P-5M-5WM-0WM. It was included in 1990-91 in 6th International winter wheat screening nursery (6th IWWSN#35) and was tested in Kabul by agricultural research institute of Afghanistan and in Logar, Baghlan and Wardak provinces by SCA. Its origin is Mexico/Oregon State in USA In 1991-1992 it was tested in the facultative winter wheat observation nursery (1st FAWWON#38) and in the (2nd FAWWON#45), in Logar, Baghlan and Paktia provinces of Afghanistan by SCA. It was also included in the 4th FAWWON#126 in 1994-95 and tested in Logar, Wardak by SCA and in Gardez by DACAAR. In 1995-96 it was tested in 5th FAWWON# 22 in Logar, Takhar, Nangrahar, Baghlan and Wardak provinces of Afghanistan by FAO. It has prostrate semi- winter growth habit. Its response to stripe rust is MR to MS. Its grain color is white. The number of grains per spike are 54. Its plant height is 108 cm. Its average thousand Kernel weight is 40 grams. Its maturity varies from location to location. In cooler areas it takes 290 days while in warm areas it matures in 206 days. It has been under observation in Ghazni province. Its mean yield over years (1991-97) and locations (19) has been 6.17 Mt./ha (Table 5). In comparison to Pirsabak-85, the long term check it has given 28% higher yield. It is recommended for cooler areas of the country.

From the material of 1995-96 crop season (Annex 1, table 1-25, wheat yield trials, observation lines and nurseries) the top yielding, disease resistant lines and varieties were selected for national, advanced and preliminary wheat trials for 1996-1997 crop season in six locations. The data on these trials is presented in Annex 2 (Tables 1-30).

Table 1. Overall shifts in use of land resources from 1978-79 to 1989-90(Area, 1000 ha, production, 1000 Mt.).

Crop	1978/97			1989/90		
Cereal	Area	Prod.	Yield %	Area	Prod.	Yield %
Wheat (IRR)	1,300	2,225	100	1,030	1,580	71
Wheat (RF)	1,048	558	100	715	378	51
Maize	482	780	100	458	587	84
Barley	310	325	100	256	238	45
Rice	210	428	100	175	280	71

IR= Irrigated, RF = Rainfed

Source UNOCHA 1993 Facts and figures on Afghanistan SCA surveys P 19 Afghanistan Rehabilitation Strategy Action Plan for Immediate Rehabilitation Volume IV Agriculture and Irrigation.

Table 2. Agriculture and food comparison in Afghanistan from 1978/79 to 1990/91.

Area Cultivated (Million ha.)	1978-79	1990-91
	3.9	2.8
Area irrigated (Million ha)	2.5	1.5
Area rainfed (Million ha.)	1.3	0.8
Per Capita food Grain production (kg)	345.0	172.0
Per Capita fruit and vegetable production (kg)	65.0	46.0
Per Capita Industrial Crops Production (kg)	21.0	10.0

Source United Nations, Afghanistan Rehabilitation Strategy Action plan for Immediate Rehabilitation 1993

Table 3. Estimated production of cereal crops 1986-87 to 1992-93 (1000 metric tons) in Afghanistan.

Name	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93
Food Grain	4408	4027	3761	3503	2765	-	2861
Wheat	2750	2620	2380	2200	1650	1200	1730
Barley	330	338	335	330	308	-	315
Corn	810	685	658	610	430	-	430
Rice	480	344	343	320	333	-	340

Source Ministry of Statistics of Afghanistan

Agronomy Trials on Wheat

In order to have a package of improved agro-techniques with the introduction of new improved wheat varieties, two cultural practices experiments (planting dates and fertilizer rates) were conducted in six zones of Afghanistan in 1996-97 crop season.

Materials and Methods

Date of Planting

The dates of planting trials was designed for both warm and cold areas of the country. There were five dates for cold areas, starting from the first of October 1996 to end of November 1996 at an interval of 15 days between each planting date. For the warm areas the first date of planting started from first of November 1996 and the last planting date was December 30, 1996 with 15 days interval between each planting date.

The experimental design was Randomized Complete Block Design (RCBD) with 4 replications and 5 treatments. The experimental unit consisted of 6 rows plot with a length of 6 meters and the distance between rows was 20 cm. The fertilizer rate was 120 kg N and 60 kg P205/ha.

Results and Discussions

The results of the warm and mild winter and cold areas are summarized in (Table 23 and 24 Annex 2). Table 23 shows the effect of different dates of planting on two wheat varieties (Kauz and Pamir-94) in the mild winter areas of the country. In Nangrahar province there is no significant differences between the yield of wheat variety Kauz in the first four dates (November 1, 15, 31 and December 15). However the yield of this variety in the these four dates is significantly different from its yield in the December 30th planting date. The mean yield in these four consecutive dates were 5525, 5345, 4735, 5465 kg/ha which are 34%,30%, 15% and 32% higher than the mean yield for the December 30th planting date (4112 kg/ha). This is translated into a yield reduction of 77 kg /ha per day delay beyond the end of December planting.

In Kandahar province in `996 the highest yield for this variety was obtained from the November 15, 1996 planting (8771 kg/ha) which ranked first and it is significantly higher than all other dates. The mean yield of wheat variety Kauz were also impressive in December 30(7747 kg/ha), December 15 (6768 kg/ha), November 31 (6366 kg/ha) and November 1 planting dates (5490 kg/ha). These yields ranked 2, 3, 4 and 5 respectively (Annex 2, Table 23).

In Balkh province there is not significant differences between the mean yields of the dates 1,2, and 3. In all three dates the wheat variety Kauz produced significantly higher yield than 4th and 5th planting dates (Annex 2. Table 23) . The lowest yield of 5258 kg/ha was obtained from December 30, 1996 planting date. The difference between the highest yield and lowest yield is 1464 kg/ha which is translated into a yield reduction of 901 kg/ha for each two weeks delay in planting.

In Herat province there is no significant difference between the mean yields of the dates of planting from the first of November to the 30th of December for wheat variety Pamir-94. However, the highest mean yield was obtained from November 15, 1996 planting with the yield of 6390 kg/ha. The November 1st planting date produced a mean yield of 6305 kg/ha. The November 31 planting produced mean yield of 6146 kg/ha, the December 15th planting yielded 5793 kg/ha and December 30th planting date gave a mean yield of 5621 kg/ha. The yield ranking is 1, 2, 3, 4 and 5th respectively (Annex 2, Table 23).

The data in (Table 24, Annex 2) shows the effect of different dates of planting on wheat varieties Kauz and Pamir 94 in cooler areas of the country. In Ghazni province the wheat variety Pamir-94 gave the highest mean yield of (7500 kg/ha) in the October 1st, 1996 planting which is significantly higher than the 3rd, 4th and 5th sowing dates. The second highest mean yield was observed in the October 15th planting with the mean yield of 6125 kg/ha and it is also significantly higher than the October 30th mean yield of 2750 kg/ha. The data in (Table 24, Annex 2) shows that a two week delay in planting resulted in 22% yield reduction while a four to six weeks delay resulted in a yield decline of 135 to 228%. There are no significant differences between the mean yield of 30 October, 15 November and 30 November. October 1 has given 22%, 127% , 228% and 135% higher yield than 15 October, 30 October, 15 November and 30 November planting respectively. The 15 October

planting has produced 122%, 168% and 92% higher grain yield than October 30, November 15 and 30th November planting respectively.

Solidarity Afghanistan a French NGO, conducted date of planting trial using the improved wheat variety Pamir-94 in Jalrez of Wardak province which has cold winter. There were six dates of planting starting from Oct. 1 to 15 of December at 15 days interval between each planting date. They found that the mean yield in kg/ha from 4 replications in the month of October is 5020 kg/ha, while the mean yield in the month of November is 3469 kg/ha and the mean yield of December 15 is 3281 kg/ha. There are significant differences between the mean yield of October, November and December dates of planting. Planting in the month of October compared to the month of November and December 15 produces 45% and 53% more yield respectively.

In Takhar province this trial was conducted using the improved wheat variety Kauz. No significant differences were recorded between the mean yields of (October 1st to November 30th) but the highest mean yield of 7538 kg/ha was observed in the October 30th which ranked first. The October 15th planting gave a mean yield of 7068 kg/ha and ranked second, the November 30th sowing resulted in a mean yield of 6983 kg/ha, the November 15 produced a mean yield of 6884 kg/ha, and the October 1, 1996 sowing produced a mean yield of 6664 kg/ha with ranking of 3, 4 and 5 respectively.

Recommendations

This is the result of one year data and definite recommendation will be questionable, therefore this types of experiments should be continued for at least 3 years in the six zones to come up with reliable recommendation for sowing dates of wheat in six zones of the country. However, based on the 1996-97 crop season data, in Nangrahar province (Table 23, Annex 2) the proper sowing date for wheat variety Kauz is from first of November to the middle of December. Planting wheat later than this there will result in a reduction of yield. In Kandahar provinces the planting of wheat variety Kauz should start from 15 of November to the end of December. This variety will produce high yields in Balkh province in November planting. The date of planting on wheat variety Kauz in Takhar province revealed that 15 October to 30 November planting will give good yield.

The results of sowing dates on wheat variety Pamir-94 (Annex 2, Table 23 and 24) indicate that in Ghazni province the first half of October is the best time of planting for wheat in Ghazni province. Later planting than this time will reduce the yield drastically. In Jelraz of Wardak province (Solidarity data) the best time of planting is the month of October. For Herat province, November planting produced the highest yields for Pamir-94.

Uniform Fertilizer on Wheat Trials 1996-97

In 1995-96 one fertilizer trial was conducted in Behsud district of Nangrahar province. In 1996-97 crop season, a fertilizer rates trial was designed to be carried out in six zones on wheat varieties Pamir-94 and Kauz. The objective of this trial was to find out the optimum and economical rates of fertilizer for wheat in six different agro climatic zones in Afghanistan.

Materials and Methods

In 1995-96 experiment, there were 4 doses of nitrogen (0, 40, 80, 100 kg/Ha) and 4 rates of P_2O_5 (0, 20, 40, 60 kg/Ha). The trial was conducted using RCBD with 3 replications. The

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N. Wassimi

Senior Technical Adviser

(UNO/AFG/001/DPS)

planted area was 3 M^2 and the harvested area was 1 M^2 with a seed rate of 100 kg/ha. All other agronomic practices were applied uniformly as required. Statistical analysis was carried on yield, plant height, spike length, number of tillers and 1000 grain weight. This study was repeated with slight modification in 1996-97 crop season on farmers fields in six locations representing six different agro-ecological zones of the country. Two wheat varieties, Pamir-94 in (Herat and Ghazni) and Kauz in (Nangrahar, Balkh, Kandahar and Takhar) provinces of Afghanistan were used for this trial. The design was RCBD with four replications and 9 treatments. The treatments consisted of (0, 57, and 115) kg of nitrogen / ha and (0, 46, and 92 kg/ha) P_2O_5 in factorial combination.

The plot size was 6 rows, 6 meters long, with a spacing of 20 cm between rows. The 4 middle rows, with 5 meter length were harvested for yield determination. The harvested area per plot was 4 M^2 . All the other agronomic practices were applied uniformly and according to plan. The results presented here is the yield in kg/ha, yield differences due to fertilizer application (treatment minus control) and economic gain. Economic gain was calculated by multiplying the price of wheat (AFS 7150 / kg) and deducting the cost of fertilizer (Nitrogen = 8700 AFS/kg, P_2O_5 = 11000 AFS/kg). The data was statistically analyzed using "MSTAT" statistical package. The mean yield of each treatment for each variety is presented in (Annex 2, Table 25 and 26).

Results and Discussions 1995-1997

The results of 1995-96 rates of fertilizer trial are summarized in Table 2 and Table 3. There are no significant differences between the yields of different rates of phosphorus fertilizer (Table 2) but, the highest yield was obtained from 20 kg P_2O_5 / ha which is 12% higher than check plot. The 60 and 40 kg of P_2O_5 /ha has given 7% and 3.5% more yield than check plot respectively.

The effect of nitrogen however is highly significant. The highest yield was obtained in response to 120 kg N/ha. but not significantly higher than 80 kg N/ha. Both treatments are significantly different from 40 and 0 kg N/ha. The treatment 120 kg/ha of nitrogen showed 43 and 188% more yield than 40 and 0 kg N/ha respectively. The treatment 80 kg N/ha showed 27% higher yield than 40 kg N/ha and 157% more yield than check plot respectively. The treatment of 40 kg N/ha yielded 101% more than the check plot. No significant interaction effect between nitrogen and phosphorus fertilizer is observed in the analysis of variances.

Table 3, shows that the highest number of tillers / plant was produced by the treatment of 120 kg N/ha, but it is not significantly higher than treatments 5-16, which shows 104 % more tillers than check plot and plots where only phosphorus was applied. The highest spike length is recorded for treatment (120 kg N/ha) but it is not significantly higher than treatments 8-16. It produced 114 % more spike length than the check plot. Plant height in (Table 3) showed that the treatment 120 kg N and 20 kg P_2O_5/ha produced the tallest plant but, it is not significantly taller than treatment 6-16. This treatment produced significantly taller plants that check plots and plots that received only P_2O_5. The highest 1000 Kernel weight was produced by 80 kg N and 20 kg P_2O_5/ha.

The results of fertilizer trials in six zones during 1996-97 are summarized in Tables 25 and 26 (Annex 2). The data of Herat province (Table 25, Annex 2) shows that in this location the highest yield was obtained from treatment N_2P_2 (115 kg/ha of nitrogen and 92 kg/ha of P_2O_5) but, it is not significantly different at 5% level of probability from the treatment N_2P_1 (115 kg/ha nitrogen and 46 kg P_2O_5 /ha) and the treatment N_1P_1 (57 kg/ha nitrogen and 46 kg/ha

of P_2O_5). These treatment gave significantly higher mean yield than other treatments. They have produced 163%, 154% and 123% more yield than the control (N_0P_0) respectively.

In Ghazni Province the same results were obtained. The highest mean yield was produced by treatment N_2P_1 and N_1P_1. They are significantly higher in yield than treatments N_0P_1 and N_0P_0 at 5% level of probability. They have given 14%, 14% and 13% more yield than check plots respectively. The mean yield in both location in control treatment are fairly high and it indicates that soil fertility of fields on which the experiment was conducted was high.

From the mean yield and rank of these two locations, it is clear that the treatments N_2P_2 with a mean yield of 8937 kg/ha, N_2P_1 with a mean yield of 8798 kg/ha and N_1P_1 with a mean yield of 8263 kg/ha ranked 1,2, and 3 respectively. Compared to check plot N_0P_0 with the mean yield of 5702 kg/ha, they produced 57%, 54% and 45% more yield.

In Nangrahar (Table 26, Annex 2) it shows that there is no significant differences between the mean yields of the fertilizer rates, however the highest yield has been obtained by treatment N_2P_0, N_1P_2 and N_1P_1 with the mean yields of 4041 kg/ha, 4038 kg/ha and 4017 kg/ha respectively. Compared to check plot (N_0P_0) with a mean yield of 3121 kg/ha, these treatments produced 29% more yield.

In Takhar province (Table 26, Annex 2), the highest mean yield was produced by treatment N_2P_1 (7225 kg/ha) but, it is not significantly different from N_2P_2 (7158 kg/ha), N_1P_2 (6363 kg/ha) and N_1P_1 (6344 kg/ha). Compared to treatment (N_0P_0) these treatments produced 72% 71%, 52% and 51% more yield.

In Kandahar province (Table 26, Annex 2), it shows that the treatment N2P2 has produced the highest mean yield of 4568 kg/ha but, it is not significantly different from treatment N_2P_1 (3951 kg/ha). Compared to treatment N_0P_0 with the mean yield of 1181 kg/ha , these treatments yielded 286 %, and 234% more yield.

In Balkh province (Table 26, Annex 2), treatment N_2P_2 produced the highest mean yield of 6988 kg/ha while N_1P_1 yielded (6490 kg/ha) and N_2P_1 yielded (6211 kg/ha) and ranked 1, 2 and 3 respectively. Statistically, there are no significantly differences between their mean yields. Compared to the check plot (N_0P_0) with the mean yield of 5492 kg/ha these treatments produced 27%, 18% and 13% more yield respectively.

Recommendations

This was the first year of this trial, therefore a definite conclusion and recommendation can not be drawn. However the experiment in Behsud in 1995-96 revealed that nitrogen was a limiting factor for wheat production on that field. No soil analysis was carried on the experimental area and therefore no information is available about phosphorus status of the soil. The yield data indicates that 80 kg/ha nitrogen and 20 kg/ha P_2O_5 can produce satisfactory yields of wheat in Behsud district of Nangrahar.

According to the results of fertilizer rates trial on Pamir-94 in 1996-97, in Herat and Ghazni provinces, application of 57 kg urea and 46 kg P_2O_5/ha gave the best yield. The second and third highest returns were observed in N_2P_1 and N_2P_2 treatments (Table 25, Annex 2). These recommendations are also applicable for wheat variety Kauz in Nangrahar, Takhar, Kandahar, and Balkh provinces. The economic gain due to fertilizer treatments is of the same order as the yield increases.

Table 1. Analysis of varianc·s (ANOVA) for yield gram/plot of fertility trial on wheat variety Spinghar-94 in Behsud district of Jalalabad, Nangrahar in 1995-96 crop season.

Source of variation	D.F.	SS	MS	F Cal.
Replication	2	1794.062	897.031	0.605
Treatments	15	377597.0	25173.133	16.981
N	3	35568.83	11856.277	7.998 **
P	3	5600.58	1866.86	1.259 NS
Nx P	9	16427.59	1825.287	1.231 NS
Error	30	44471.94	1482.398	
Total	47	423863.0		

CV = 15% LSD = 43.22 g/plot

Table 2. Summary of mean yields (kg/ha) of fertilizer trial on wheat variety Spinghar-94 in Behsud district of Jalalabad, Nangrahar and its effect ranking statistically in 1995-96 crop season.

Nitrogen			P_2O_5 kg/ha				N significance
kg/ha	0	20	40	60	Total	N effect	
0	3030	3680	3630	3790	14130	1177	C
40	5980	7610	7740	7170	28500	2375	B
80	9480	8320	8030	10320	36140	3011	A
120	9790	12180	9860	8910	40740	3395	A
Total	28270	31790	29260	30190	119510		
P effect	2355	2649	2438	2515			
P Significance	A	A	A	A			

Rates having the same letter are not significantly different from each other at P= 0.05 level.

Table 3. Number of tillers per plant, spike length, plant Height, and 1000 Kernel Weight of Wheat as influenced by different combinations of nitrogen and phosphorus during 1995-1996 crop season in Behsud Farm in Nangrahar province.

No	Fertilizer Combinations N+ P_2O_5 kg/ha	No. of tillers /plant	Rank	Spike Length in cm	Rank	Plant Height in cm	Rank	1000 Kernel Weight in Grams	Rank
1	N_1P_1 (0-0)	2.3	8	4.2	11	47	13	27.8	14
2	N_1P_2 (0+20)	2.3	8	4.3	10	60	10	30.3	12
3	N_1P_3 (0+40)	2.3	8	5.3	9	57	12	28.7	13
4	N_1P_4 (0+60)	2.6	7	6.3	7	67	9	30.8	11
5	N_2P_1 (40+0)	3.0	6	6.0	8	59	11	33.2	7
6	N_2P_2 (40+20)	3.3	5	6.7	6	73	6	33.5	6
7	N_2P_3 (40+40)	3.0	6	6.7	6	70	8	32.5	8
8	N_2P_4 (40+60)	3.7	4	7.7	5	72	7	34.2	4
9	N_3P_1 (80+0)	4.3	2	8.0	4	75	4	34.5	3
10	N_3P_2 (80+20)	4.0	3	8.7	2	72	7	36.7	1
11	N_3P_3 (80+40)	4.0	3	7.7	5	76	3	35.2	2
12	N_3P_4 (80+60)	4.3	2	8.0	4	75	4	33.8	5
13	N_4P_1 (120+0)	4.7	1	9.0	1	74	5	33.5	6
14	N_4P_2 (120+20)	4.3	2	8.0	4	80	1	32.5	8
15	N_4P_3 (120+40)	4.3	2	8.0	4	73	6	33.5	6
16	N_4P_4 (120+60)	3.0	6	8.3	3	77	2	32.7	9

Mean of 3 replications.

Annex 1
Wheat data 1991-1995
(Tables 1-25)

Table 1. Mean yield (kg/ha) and rank (R) of 15 bread wheat lines tested in (95 NWYT1) in three locations in Northern Afghanistan during 1995-96 crop season.

No.	Variety name or pedigree	Baghlan		Balkh		Takhar		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	% N.C.
1	SPEENGHAR-94= (SERI*3//BUC/BJY"s	4712	3	4660	6	4564	4	4645	2	109
2	ARIANA-94 (BOW"s"/NAC//VEE/3/BJY	5037	1	4793	3	4798	1	4876	1	115
3	Kaghan-93(TTR/JUN)	4550	4	4539	7	3966	9	4352	6	102
4	VEE#7/OPATA	4482	6	4987	1	3955	10	4475	4	105
5	SU92/CI13465//PGFN/3/PHO/4/..	3883	13	4151	11	4125	6	4053	12	95
6	TRAP#1//BOW	4533	5	4262	10	3687	13	4161	10	98
7	VRZ/3/OR F1.158/FDL/BLO	4179	9	4911	2	4020	8	4370	5	103
8	PIRSABAK-85(KVZ/BUHO//KAL/BB)	3987	12	4751	4	4034	7	4257	8	100
9	PAMIR-94(YMH/TOB/MCD/3/LIRA SW	5004	2	4437	8	4363	5	4601	3	108
10	BLOUNDANL/3/Bb/7C*2//Y50E/Kal*3	4067	11	3965	13	4749	2	4260	7	100
11	Dove"s"/BUC"s"	4121	10	4322	9	3904	11	4116	11	97
12	Dove"s"/Inia/4/4777(2)//Fkn/Cb/3/Pvn"s"	3679	14	4673	5	3695	12	4016	13	94
13	Kauz (CM7458-4Y-1M-3Y-1M-3Y-O8-0S	4242	8	3870	14	4648	3	4253	9	100
14	90-ZHONG-92	2921	15	4006	12	2943	14	3290	15	77
15	F12.71/COC/BAU	4433	7	3790	15	2798	15	3674	14	86
	Location mean yield	4255		4408		4017		4227		
	LSD at 5% level	773		832		803				
	% C.V.	12.74		13.23		14.02				
	% N. C. = % of Pirsabak-85									

Table 2. Mean yield (kg/ha) and rank (R)of 15 bread wheat lines tested (95 NWYT1) in five locations in East Central and Eastern Afghanistan during 1995-96 crop season by FAO.

No.	Variety name or pedigree	Nangrahar		Kandahar		Kunar		Logar		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N.C.
1	SPEENGHAR-94= (SERI*3//BUC/BJY"s	3648	9	4865	8	5971	7	6117	12	7533	5	5627	9	121
2	ARIANA-94 (BOW"s"/NAC//VEE/3/BJY	3693	7	5281	5	6400	2	6958	4	6792	7	5825	6	125
3	Kaghan-93(TTR/JUN)	3870	5	4969	7	6179	4	6633	7	6608	8	5652	7	121
4	VEE#7/OPATA	2922	14	5812	2	5775	8	7283	2	7500	6	5858	4	126
5	SU92/CI13465//PGFN/3/PHO/4/..	2923	13	4812	9	4758	15	6767	5	7842	3	5420	11	116
6	TRAP#1//BOW	3530	10	4760	11	6158	5	6622	8	6387	11	5491	10	118
7	VRZ/3/OR F1.158/FDL/BLO	3673	8	5812	1	6217	3	6133	11	6367	12	5640	8	121
8	PIRSABAK-85(KVZ/BUHO//KAL/BB)	2677	15	4427	12	5758	9	5358	15	5121	15	4668	15	100
9	PAMIR-94(YMH/TOB/MCD/3/LIRA SW	4473	3	5323	4	5333	10	6708	6	7758	4	5919	2	127
10	BLOUNDANL/3/Bb/7C*2//Y50E/Kal*3	4437	4	5146	6	6696	1	7017	3	8500	1	6359	1	136
11	ID800994.W/VEE (94PWYT2 #6)	4750	2	4354	14	5004	13	7296	1	8108	2	5902	3	126
12	HAW-19/5/CNN/KKV//KC66 (94PWYT1	3836	6	4802	10	5179	11	6417	10	6575	9	5362	12	115
13	Kauz (CM7458-4Y-1M-3Y-1M-3Y-O8-0S	4763	1	5437	3	6021	6	6592	9	6433	10	5849	5	125
14	90-ZHONG-92	2997	12	4375	13	4817	14	5750	14	5992	14	4786	14	103
15	F12.71/COC/BAU	3047	11	4333	15	5146	12	5850	13	6200	13	4915	13	105
	Location mean Kg/ha	3683		4967		5694		6500		6914		5552		
	LSD at P= 5%	612		952		633		1057		1105				
	% C.V.	11.72		11.46		7.79		11.39		11.19				

%. N. C. = % of Pirsabak-85

Table 3. Mean yield (kg/ha) and rank (R) of ten bread wheat lines tested in (95 NWYT2) under irrigated conditions in six locations in Afghanistan during 1995-96 by FAO.

		Balkh		Baghlan		Takhar		Laghman		Nangrahar		Wardak		Overall mean		
No.	Variety	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	%N.C.
1	ATAY-85 (check)	4707	2	4612	5	4213	7	7708	1	5040	9	7233	4	5586	4	100
2	PAMIR-94(YMH/TOB/MCD/3	4068	8	5075	1	4371	4	6642	6	6269	2	8371	1	5799	1	104
3	NAI60/HN7//BUC/5/F59.71/4/.	4259	6	4704	3	4283	6	5467	10	3096	10	6833	8	4774	9	85
4	ID13.1/MLT(SWM12174-18N(	3355	10	4458	6	2775	10	6258	8	5555	7	5867	10	4711	10	84
5	ANZA/KATYA A1	5375	1	4204	9	4183	8	6008	9	6439	1	7433	3	5607	3	100
6	TAST/PCH/BEZ2B/CGN	4355	4	4050	10	4292	5	6525	7	5829	4	8000	2	5509	5	99
7	HAW-19/5/CNN/KKV//KC66	4267	5	4450	7	4613	2	6783	4	6115	3	6533	9	5460	6	98
8	BLL/SERI	3743	9	4329	8	4692	1	6708	5	5665	5	6929	7	5344	8	96
9	ID800994.W/VEE	4704	3	4871	2	4105	9	7592	2	5571	6	7125	6	5661	2	101
10	NS55-58/VEE	4114	7	4696	4	4388	3	6833	3	5108	8	7217	5	5393	7	97
	Location Mean Kg/ha	4295		4545		4192		6652		5469		7154				
	LSD 5%	1073		627		707		1119		9072		1345				
	C.V. %	17.63		9.52		11.63		11.59		12.25		12.96				

%N.C. = % of national check (Atay-85)

Table 4. Mean yield (kg/ha) and rank (R) of ten bread wheat lines tested (95NWYT3) in five locations in Afgnanistan during 1995-96 by FAO.

No.	Variety	Logar		Wardak		Baghlan		Kandahar		Nangrahar		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N.C.
1	PYN/BOW	4900	10	7850	6	3904	4	4375	10	3486	2	4903	6	101
2	GOLESTAN	5300	8	7208	8	3642	7	5229	5	2782	8	4832	8	99
3	ALBORZ	4916	9	6700	9	2842	10	5250	4	2181	10	4378	10	90
4	K2340/SX//MT/GB/3/K340/FR/4/Pi"s"/KT54/NAR"s"	5725	3	8433	3	4212	1	4750	8	3288	3	5282	3	108
5	PIRSABAK-85 NATIONAL CHECK	5341	6	7575	7	3321	9	5396	3	2727	9	4872	7	100
6	F13471/CROW"s"	5333	7	7850	5	4025	3	5708	2	3143	4	5212	5	107
7	TI/PCH/5/MT48/3/WT*3//NAR59/TOTA63/4/MUS	5591	4	7858	4	3792	5	6135	1	3018	7	5279	4	108
8	BOW"s"/NKT"s"	5591	5	6600	10	3455	8	4989	7	3069	6	4741	9	97
9	KVZ/TI 71/3/MAYA"s"//INIA/4/KJ2/5/ANZA/3/PJY/NAR//HYS	6679	1	8475	2	3771	6	5052	6	3519	1	5499	1	113
10	1-27-6275xCF 1770	5866	2	9067	1	4067	2	4401	9	3136	5	5307	2	109
	Location Mean Kg/ha	5524		7762		3703		5129		3035				
	LSD 5%	921		963		468		1001		560				
	C.V. %	11.49		8.55		8.71		11.37		12.71				

% N. C. = % of National check (Pirsabak-85)

Table 5. Mean yield (kg/ha) and rank (R) of 15 bread wheat lines tested in (95NRWYT4) under rainfed conditions in Afghanistan during 1995-96 by FAO.

No.	Variety	Baghlan		Takhar		Overall mean		
		Yield	R	Yield	R	Yield	R	% N. C.
1	GALVEZ	911	7	203	11	557	7	136
2	PRL"s"/PEW	1025	3	202	12	614	3	150
3	NAC/3/STW63	964	5	244	8	604	5	147
4	BAU/SERI	748	13	309	3	529	14	129
5	PRISABAK-91	697	15	122	15	410	15	100
6	KVZ/BJY's'	1208	1	249	7	729	1	178
7	CHIL/WUH3	1010	4	212	10	611	4	149
8	Kasyon/Glennson.81	726	14	368	1	547	10	133
9	Kasyon//PVN's'/SPRW's'	821	10	281	5	551	9	134
10	FLK's'/HORK/6/WA4767/391	875	9	196	13	536	13	131
11	Fta/Cj//Fury/Kal*3/3/pvn's'/S/Pato	917	6	172	14	545	12	133
12	VEE's'/S/SKh8/4/RRV/WW15/3/Bj's'//On*3/Bon	896	8	222	9	559	6	136
13	Cham 6	805	11	299	4	552	8	135
14	TOW's'/PEW's'	769	12	324	2	547	11	133
15	HD2206/HORK//BUC/BUL	1047	2	262	6	655	2	160
	Location Mean kg/ha	895		244				
	LSD at 5 %	370		219				
	C.V. %	28.96		62.84				

% N.C. = % of national check (Pirsabak-85)

Table 6. Mean yield (kg/ha) and rank (R)of ten bread wheat lines tested in preliminary trial (95PWYT1) under irrigated conditions in three location in Afghanistan during 1995-96.

No.	Pedigree or cross	Baghlan		Balkh		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	% N.C.
1	NAI/PJ//EMU/3/MRL/BUC	4721	8	6677	4	8133	7	6510	6	101
2	OPATA/CUPE	6433	1	6771	3	8367	5	7190	2	111
3	GIM/BUC	4550	9	5941	9	8400	4	6297	10	98
4	MN75136/PGO	6057	3	7026	2	6983	10	6689	4	104
5	SUZ4/WEAVER	5271	6	6598	5	8217	6	6695	3	104
6	MYNA/VUL//PRL	6079	2	7371	1	9500	1	7650	1	119
7	FILIN	5208	7	5435	10	8817	2	6487	7	101
8	BUGU	5738	4	6248	7	7233	9	6406	9	99
9	MIMUS	5679	5	6382	6	7933	8	6665	5	103
10	PIRSABAK-85	4433	10	6159	8	8767	3	6453	8	100
	Location Mean Kg/ha	5417		6461		8235				
	LSD at 5%	850		1210		1987				
	C.V. %	10.82		12.91		16.63				

% N. C. = % of National check (Pirsabak-85)

Introduction

The introduction of improved varieties of cereals, vegetable and food legume crops, along with improved agro-techniques promoted through 19 agriculture research stations in the country and with an active role of agriculture extension, Afghanistan achieved food self sufficiency in 1977.

This trend came to an abrupt halt and crop productivity declined as a consequence of the past twenty years of war and civil strife. The varieties that were once high yielding lost their yield potential because of the changes in the biology of disease causing organisms (specially rusts). Other contributors to decline in crop productivity are unavailability of good quality pure seed of cereal crops, lack and/or high cost of inputs such as fertilizer, plant protection material, destruction of irrigation infrastructure, infestation of weeds, displacement of technical staff, farmers and destruction of institutions.

After the Geneva accord, FAO cross border activities started along with scattered crop variety screening by some international NGOs. Through this work some wheat, maize and rice varieties were introduced from Pakistan to Afghanistan. This work was important in the initial agricultural rehabilitation phase but, in order for the country to reestablish food self sufficiency, systematic varietal screening and early generation seed production was deemed necessary and in 1996 with the financial support of SIDA, the crop improvement project (UNO/AFG/001/DPS) was launched in six agro-ecological zones (North, North Eastern, North Western, South, East Central and Eastern). Since 1996, the crop improvement project has conducted varietal screening and agronomic trials in these zones and has succeeded in the introduction and release of new varieties of wheat (*Triticum aestivum*) , rice (*Oryza sativa*) and barley (*Hordeum vulgare*). Good data has been gathered on the dates of planting and fertilizer requirement of wheat and rice. On maize (*Zea mays*), the data has been summarized and presented for both high and low elevations. Varietal screening work has been conducted on lentil (*Lens culinaris*), chickpea (*Cicer arietinum*), beans (*Phaseolus vulgaris*), mung bean (*Vigna mungo*) and pea (*Pisum sativum*). This report summarizes the research findings for 1995-96 and 1996-97 crop seasons by FAO crops and NGOs working on agriculture in Afghanistan.

Table 7. Mean yield (kg/ha) and rank of ten bread wheat lines tested in a preliminary yield trial (95PWYT2) in four locations in Afghanistan under irrigated conditions during 1995-96 by FAO.

		Baghlan		Balkh		Nangrahar		Wardak		Overall mean		
No.	Variety or line	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
1	FTC	5175	7	7768	4	2355	4	8650	5	5987	4	113
2	BB//TOB/CNO67/3/HUAC/4/TI-R/	4937	9	6202	10	2130	7	7933	8	5301	10	100
3	MON/IMU//ALD/PVN	5910	1	7093	5	2170	6	8017	7	5798	6	109
4	CMH80A-542/CNO79	5683	2	8531	1	1975	9	9300	4	6372	2	120
5	KAUZ/GEN	5450	4	8066	3	2495	2	10450	1	6615	1	125
6	KAUZ*2/OPATA//KAUZ	4821	10	8152	2	2120	8	10167	2	6315	3	119
7	KAUZ*2/BOW//KAUZ	5089	8	6965	6	2247	5	9567	3	5967	5	112
8	V763.2312	5204	6	6917	7	2360	3	7000	10	5370	8	101
9	PICUS	5458	3	6202	9	2707	1	8483	6	5713	7	108
10	PIRSABAK-85	5267	5	6690	8	1892	10	7383	9	5308	9	100
	Location mean Kg/ha	5299		7259		2245		8695		5875		
	LSD at 5%	710		1399		768		1875				
	C.V. %	9.23		13.29		23.58		14.86				

% N.C. = % of national check (Pirsabak-85)

Table 8. Mean yield (kg/ha) and rank (R) of ten bread wheat lines tested under irrigated conditions in a preliminary yield trial (95PWYT3) in five locations during 1995-96 in Afghanistan by FAO.

		Baghlan		Balkh		Kandahar		Nangrahar		Wardak		Overall mean		
No.	Variety or line	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
1	URES/JUN//KAUZ	4875	1	5555	7	4292	7	3730	1	7692	2	5229	2	107
2	TOB//HD832/BB/3/MON/4/BUC	4654	2	5127	8	4583	6	3167	3	6900	8	4886	5	100
3	PFAU/BOW//VEE#9	3583	10	5659	6	4646	5	2813	9	7517	4	4844	7	99
4	CHIL/PRL	4504	3	6079	2	4813	4	3156	4	7375	5	5185	3	106
5	CHIL//ALO/PVN	4050	6	5757	3	4031	8	2908	8	6750	9	4699	9	96
6	TURACO/CHIL	3908	7	6113	1	4958	3	3642	2	8067	1	5338	1	110
7	PFAU/VEE#9//URES	3846	8	5686	5	5010	2	2956	7	7517	3	5003	4	103
8	PRL/VEE#6//MYNA/VUL	4367	4	4636	10	3948	10	3052	5	6525	10	4506	10	92
9	PRL/VEE#6//MYNA/VUL	4121	5	5099	9	4010	9	3045	6	7308	7	4717	8	97
10	PIRSABAK-85	3717	9	5732	4	5083	1	2472	10	7350	6	4871	6	100
	Location mean kg/ha	4163		5544		4537		3094		7300		4928		
	LSD at 5 %	966		876		1365		572		988				
	C.V. %	15.99		10.89		17.54		12.75		9.33				

% N. C. = % of national check (Pirsabak-85)

Table 9. Mean yield (kg/ha) and rank (R) of 15 bread wheat lines tested under irrigated condition in a preliminary yield trial (95PWYT4) during 1995-9 in six locations in Afghanistan by FAO.

No.	Variety or line	Baghlan		Balkh		Nangrahar		Kandahar		Takhar		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
1	TURACO/CHIL	4412	5	6072	10	2473	15	5635	7	3550	6	4721	11	4477	10	101
2	KEA/TOW//LIRA	4367	7	6528	6	3977	3	6656	3	2975	13	4512	12	4836	5	109
3	ND/VG9144//KAL/BB/3/YACO/4/CHIL	4629	3	6352	7	3957	4	5281	8	3233	10	5158	5	4768	8	108
4	SPEENGHAR-94= (SERI*3//BUC/BJY"s" CF	4162	9	6658	5	3665	7	5990	6	4192	3	4758	10	4904	4	111
5	ARIANA-94 (BOW"s"/NAC//VEE/3/BJY/CO	4554	4	7288	1	3202	13	6594	4	4550	1	4937	6	5188	2	117
6	CHUM21	3325	13	5458	15	3635	8	5271	9	2696	15	4029	15	4069	14	92
7	NANJNG 8611	3292	14	5498	14	3388	9	4406	15	2996	12	4371	13	3992	15	90
8	SIBIA	4058	10	6923	2	3230	12	5083	11	3329	8	4233	14	4476	9	101
9	OPATA	4733	2	5928	11	3814	5	4833	13	4133	4	5458	1	4817	6	109
10	BAV92	4213	8	6803	3	3233	11	6896	1	4308	2	5417	3	5145	3	116
11	SITE	4762	1	6307	8	4330	2	4719	14	3508	7	5242	4	4811	7	109
12	MUNIA	4004	11	5608	13	3118	14	4885	12	3021	11	4933	8	4262	13	96
13	ARIV92	3117	15	6201	9	3727	6	6000	5	2938	14	4792	9	4463	11	101
14	ATILA	4392	6	6793	4	4454	1	6698	2	3908	5	5442	2	5281	1	119
15	PIRSABAK-85	3867	12	5888	12	3322	10	5260	10	3321	9	4933	7	4432	12	100
	Location mean kg/ha	4126		6287		3568		5614		3511		4862		4661		
	LSD at 5 %	893		638		553		877		979		1050				
	C. V. %	15.17		7.11		10.87		19.99		19.53		15.14				

% N. C. = % of national check (Pirsabak-85)

Table 10. Mean yield (kg/ha) and rank (R) of 15 bread wheat lines tested under irrigated conditions in a preliminary yield trial (95PWYT5) in six locations during 1995-96 in Afghanistan by FAO.

No.	Variety or line	Baghlan		Balkh		Takhar		Nangrahar		Kandahar		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
1	PASTUR	4396	3	6585	1	3858	13	5386	1	6167	2	7058	3	5575	1	115
2	TURACO	3825	8	5972	11	4017	10	3885	12	5115	12	6358	7	4862	9	100
3	WEAVER	4146	5	6141	8	3713	15	4546	7	5438	7	6900	4	5147	6	106
4	CBRD	3800	9	6324	3	4158	8	4562	6	5563	4	6742	5	5192	5	107
5	CLC89	3192	15	6276	4	3779	14	4711	5	5469	6	6150	8	4930	8	102
6	NESTUR	3737	10	5755	13	4308	5	4339	9	4833	13	6092	9	4844	11	100
7	PBW299	4033	7	6414	2	4375	3	4189	11	4688	14	5242	13	4824	12	99
8	OR791432/VEE#3.2	4075	6	5514	14	3892	11	4277	10	5406	8	7350	1	5086	7	105
9	BAU	3467	13	4948	15	3875	12	3300	15	4531	15	4667	15	4131	15	85
10	MNV/BUC	3471	12	5765	12	4283	6	4372	8	5281	9	5125	14	4716	14	97
11	STERN	3446	14	6089	9	4471	2	4799	4	6521	1	6392	6	5286	4	109
12	FRTL	4300	4	6255	5	4100	9	3604	14	5146	11	5292	12	4783	13	99
13	IRENA	4554	2	5982	10	4908	1	4877	3	6021	3	6000	10	5390	3	111
14	P.S.85	3658	11	6207	6	4338	4	3715	13	5479	5	5692	11	4848	10	100
15	KAUZ	4862	1	6190	7	4163	7	5147	2	5208	10	7192	2	5460	2	113
	Location mean kg/ha	3931		6028		4149		4381		5391		6150		5005		
	LSD at 5 %	743		685		865		858		1140		981				
	C. V. %	12.42		7.96		14.61		13.73		12.64		11.17				

% N. C. = % of national check (Pirsabak-85)

Table 11. Mean yield (kg/ha) and rank (R) of 15 bread wheat lines tested in (95PWYT6) under irrigated conditions in five locations in a preliminary yield trial during 1995-96 in Afghanistan by FAO.

No.	Variety or line	Baghlan		Balkh		Nangrahar		Takhar		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	N. C.
1	HE 1/3*CNO79//2*SERI	3725	7	5349	8	1967	13	3892	8	6483	3	4283	6	106
2	NL 456/VEE#5	3408	14	5233	12	2075	10	3438	14	4275	15	3686	15	91
3	URES*2/PRL	3367	15	5366	7	2433	7	3650	12	5175	13	3998	13	99
4	TJB368.251/BUC//TURACO	3412	13	5752	2	2514	4	3142	15	6067	5	4177	8	104
5	MON/JMU//ALD/PVN	3746	6	5120	13	2381	8	4022	6	5775	8	4209	7	104
6	VORONA/BAU//BAU	3800	5	4798	15	1970	12	3883	9	5208	12	3932	14	98
7	TJB368.251/BUC//OCI	3962	3	5382	5	2576	2	4438	3	5333	10	4338	4	108
8	JUP/ZP//COC/3/PVN/4/GEN	3471	11	5392	4	2526	3	4525	2	6750	1	4533	2	113
9	BAU/SERI	3542	9	5321	9	2059	11	4179	5	4908	14	4002	12	99
10	TURACO/CHIL	4179	2	5370	6	1402	15	3950	7	5208	11	4022	11	100
11	ND/VG9144//KAL/BB/3/YAC	4221	1	5781	1	2466	6	4958	1	6208	4	4727	1	117
12	TJ8368.251/BUC//CUPE	3525	10	5246	11	2608	1	4329	4	5783	7	4298	5	107
13	PRLII/CM65531	3650	8	5393	3	2499	5	3542	13	6650	2	4347	3	108
14	BAU/SERI	3808	4	5308	10	2141	9	3792	11	5467	9	4103	9	102
15	Pirsabak-85	3442	12	5063	14	1844	14	3838	10	5958	6	4029	10	100
	Location mean kg/ha	3684		5325		2231		3972		5683		4179		
	LSD at 5 %	580		782		398		698		871				
	C.V. %	11.03		10.29		12.49		12.32		10.74				

% N. C. = % of national check (Pirsabak-85)

Table 12. Mean yield (kg/ha) and rank (R) of ten bread wheat lines tested under irrigated conditions in (95PWYT7) in three location in a preliminary yield trial in Afghanistan during 1995-96.

No.	Variety or line	Baghlan		Takhar		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
1	KEA/BUC//FCT	5685	7	5233	4	6833	12	5917	10	89
2	SARA/THB//VEE	5210	13	4900	10	7667	7	5926	9	89
3	SERI/CEP80120	4760	15	4783	14	7083	9	5542	14	83
4	COOK/VEE//DOVE/SERI/3/BJY/COC	5955	6	5042	8	6467	13	5821	12	87
5	OR791432/VEE#3	5495	11	5208	5	8283	4	6329	4	95
6	VEE#5//DOVE/BUC	6228	2	5729	1	6850	11	6269	5	94
7	VEE#5//DOVE/BUC	6160	5	4858	11	6183	14	5734	13	86
8	CNO79/PRL//GAA	6188	4	3925	15	5550	15	5221	15	78
9	CHIL/BUC	6350	1	4817	13	7217	8	6128	8	92
10	JUP/ZP//COC/3/PVN/4/GEN	4925	14	5008	9	8617	3	6183	7	93
11	PIK/OPATA	5535	9	5246	3	7867	6	6216	6	93
12	GIM/LIRA	5440	12	5338	2	9700	1	6826	1	102
13	OPATA/KILL//PRL/VEE#6	6218	3	5179	7	8200	5	6532	3	98
14	VEE#8//HD2206/HORK	5600	8	5200	6	6883	10	5894	11	88
15	Pirsabak-85	5535	10	4850	12	9633	2	6673	2	100
	Location mean kg/ha	5686		5021		7536		6081		
	LSD at 5 %	1005		974		3055				
	C.V. %	12.39		13.59		28.41				

% N. C. = % National check (Pirsabak-85)

Table 13. Mean yield (kg/ha) and rank (R) of ten bread wheat lines tested under irrigated conditions in four location in a preliminary yield trial (95PWYT8) in Afghanistan during 1995-96 by FAO.

No.	Variety or line	Baghlan		Takhar		Wardak		Nangrahr		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
3	RL601016*YR//3*SERI	5780	5	2192	9	8600	1	2550	4	4781	1	122
4	LIRA/SHA5	5955	3	2737	7	7517	2	2587	2	4699	2	120
9	KAUZ	5615	6	3229	3	7300	4	2610	1	4689	3	119
2	TIA.2	5920	4	2971	4	6850	6	2575	3	4579	4	117
6	MAYA/7/H/RA/2F2/3/BB/5*YC//RA/2F2/6/BB	4925	9	3614	1	7433	3	2175	5	4537	5	115
8	CETTIA	5995	2	3300	2	6233	10	2018	7	4387	6	112
7	BABAX	6360	1	2783	6	6550	8	1751	8	4361	7	111
1	SERI//HUI/TUB/3/TRAP#1	5205	8	2800	5	6833	7	1723	9	4140	8	105
5	BR12*3/3/BR14//LD*6/FB6628	5445	7	2254	8	6300	9	2160	6	4040	9	103
10	PirSabak-85	4895	10	2179	10	7017	5	1625	10	3929	10	100
	Location mean kg/ha	5719		2953		7165		2249				
	LSD at 5 %	830		840		2098		729				
	C.V. %	10.2		20.62		20.48		23.06				

% N. C. = % National check (Pirsabak-85)

Table 14. Mean yield (kg/ha) and rank (R) of 15 facultative and winter bread wheat lines tested under irrigated conditions in three locations in a preliminary yield trial (95PWWYT9) in Afghanistan during 1995-96 BY FAO.

		Wardak		Logar		Nangrahar		Overall mean		
No.	Variety or line	Yield	R	Yield	R	Yield	R	Yield	R	% N. C.
1	KNR/TRAKIA	6612	3	5492	7	5782	4	5962	2	104
2	BUL5121.1	4750	12	5133	10	5387	6	5090	11	89
3	ATAY-85	6862	1	6217	3	4042	13	5707	3	100
4	F364P5.1	5354	8	5050	12	3992	14	4799	13	84
5	ZO/BIG SEED	5975	5	4567	13	4870	9	5137	10	90
6	ZO/SZG	4737	13	4167	15	5252	7	4719	14	83
7	ID13.1/MLT	5400	7	6417	1	4913	8	5577	5	98
8	AGRI/NAC/LIRA	5500	6	6392	2	4759	11	5550	6	97
9	AGRI//BJY//VEE	5017	9	5883	6	4808	10	5236	8	92
10	PIMIR-94	6208	4	5950	5	5849	1	6002	1	105
11	CI13684/VEE#5	4875	11	5100	11	4752	12	4909	12	86
12	VORONA//PRL/VEE#6	3742	15	4250	14	5417	5	4470	15	78
13	KS79441/SERI	4958	10	6067	4	5802	3	5609	4	98
14	NEMURA/HD2329	4412	14	5325	9	5818	2	5185	9	91
15	PYN/SERI	6700	2	5458	8	3755	15	5304	7	93
	Location mean kg/ha	5407		5431		5013		5284		
	LSD at 5 %	1428		990		858				
	C.V. %	18.51		12.78		11.99				

% N. C. = % of National check (Atay-85)

Table 15. Mean yield (kg/ha) and rank (R) of ten facultative and winter bread wheat lines tested under irrigated conditions in three locations in a preliminary yield trial (95PWYT10) in Afghanistan during 1995-96.

No.	Variety or cross no	Nangrahar		Logar		Wardak		Overall mean		
		Yield	R	Yield	R	Yield	R	Yield	R	% N.C.
1	RAN/NE701/36//CI13449/CTK/3/SERI	4141	8	5300	7	5133	7	4858	8	82
2	ZCL/3/PGFN//CNO67/SON64(ES86-8)/4/LAJ251	4630	3	5692	5	4833	9	5052	7	85
3	AU/3/MINN//HK/38MA/4/YMH/ERA/5/PMF//CN	6225	1	5233	8	5058	8	5505	4	93
4	CLLF/BEZ//SU92/CI13645/3/NA160/4/EMU/5/DY	4187	7	4187	10	5683	5	4686	9	79
5	AGRI/NAC(ESSBVDA-91-22)	4407	4	5375	6	7525	1	5769	2	97
6	KS73H530/VEE	3912	9	6012	3	6583	4	5502	5	93
7	AGRI/NAC	4640	2	5792	4	6717	3	5716	3	96
8	AKN/SNB	4260	6	6017	2	5508	6	5262	6	89
9	CHK's'/BOW's'	3652	10	4775	9	4667	10	4365	10	74
10	ATAYA-85	4389	5	6467	1	6933	2	5930	1	100
	Location mean kg/ha	4444		5485		5864		5264		
	LSD at 5 %	823		892		1560				
	C.V. %	12.76		11.21		18.34				
	% N. C. = % of National check (Atay-85)									

Table 16. Mean yield over 3 replication (Kg/ha) of 24 lines from the Regional Bread Wheat Yield Trial Favorable Environment 95-96 Tested by FAO in Afghanistan in 6 locations.

		Balkh		Kandahar		Khost		Nangrahar		Baghlan		Takhar		Overall mean		
No	Name	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% L. C.
1	Maxipak 65 (L.C)	4827	19	4133	4	3261	15	3203	21	4672	5	5467	23	4261	17	100
2	Caskor	5529	6	3678	7	3233	16	4370	7	4511	10	5833	16	4526	5	106
3	Bocro-3	5358	10	4189	3	3156	19	3994	15	3911	19	6122	7	4455	8	105
4	Fow-1	4876	18	4444	1	3311	14	4080	10	3661	22	6150	5	4420	13	104
5	Dove's'/Inia/4/47	5451	7	3911	5	2722	23	4053	12	4617	7	5933	11	4448	10	104
6	Bloudan/3/Bb/7C*	6301	1	3500	10	3494	11	5102	1	4483	13	6106	9	4831	1	113
7	Kapsw	6060	3	2808	18	4409	1	4554	5	3439	23	5739	17	4502	7	106
8	Bow's'/Crow's'	6183	2	3589	8	3333	12	4764	4	4056	17	5211	24	4523	6	106
9	Gv/Ald's'/5/Ald's	5138	15	2578	19	4000	4	4074	11	4867	3	5672	19	4388	14	103
10	Nai60/Hn7/SX	4106	22	1922	23	4000	5	3333	20	4489	12	5972	10	3970	22	93
11	Fong Chan#3/Trt'	5668	5	2478	21	3006	22	3967	17	2461	24	5667	20	3875	23	91
12	Cham-4 (Improved	5675	4	3433	11	3622	9	4441	6	4592	8	5850	15	4602	4	108
13	Bobwhite#1/Fengk	5318	11	3011	15	4233	2	4116	9	4489	11	6628	1	4633	3	109
14	4777(2)/Fkn/Gb/3	4082	23	2344	22	4144	3	3662	19	4478	14	5478	22	4031	20	95
15	Gv/Ald's'/5/Ald's	5142	14	3533	9	3322	13	4833	3	3861	21	5928	12	4437	12	104
16	Bocro-2	5057	16	4322	2	3867	7	4945	2	4283	15	5589	21	4677	2	110
17	Gv/Ald's'/5/Ald's	5276	12	2944	16	3522	10	4041	13	3972	18	6122	6	4313	15	101
18	Maya74's'/On//Il6	5364	9	2889	17	3633	8	4033	14	4222	16	5683	18	4304	16	101
19	Dove's'/Tsi/5/Gv/	5152	13	3356	12	3889	6	3087	22	4894	2	6283	3	4444	11	104
20	Gim/Buc	4997	17	2489	20	3011	21	3665	18	4911	1	6189	4	4210	18	99
21	Ducula	4614	21	3344	13	2256	24	3982	16	3911	20	5900	14	4001	21	94
22	Picus	4737	20	3811	6	3200	18	4323	8	4717	4	5906	13	4449	9	104
23	Cham-1 (Improved	3857	24	911	24	3222	17	2978	23	4524	9	6383	2	3646	24	86
24	National check	5367	8	3211	14	3011	20	2184	24	4647	6	6106	8	4088	19	96
	Location mean	5172		3201		3452		3991		4278		5913		4335		
	LSD at 5 %	1422		1750		1283		922		931		741				
	C.V. %	16.7		33.26		22.61		14.05		13.24		7.63				

% L. C. = % of long term check (Maxipak-65) R= Rank

Executive Summary

The enhanced crop productivity project (UNO/AFG/001/DPS) started its activities under direct FAO crops implementation in 1996. The objectives of this project were to screen, identify, recommend improved high yielding, disease and stress tolerant varieties of cereal and food legumes crops and to produce early generation (breeder nucleus and pre-basic) class seed of the newly recommended genotypes for further multiplication and distribution to farmers in Afghanistan. The varietal screening activities were conducted in Balkh, Takhar, Herat, Kandahar, Ghazni, and Nangrahar provinces of Afghanistan representing six agro-climatic zones. This report summarizes the data obtained by the project in 1995-96 and 1996-97 crop seasons. In addition to these two years data of FAO crops, the results of research activities carried out by Swedish Committee for Afghanistan (SCA), Danish Committee for Aid to Afghan Refugees (DACAAR) and Mission d' Aide au Development des Economies Rurales Afghanistan (MADERA) has been included as well to get an even broader view of the performance of genotypes tested in the country. The findings are summarized as follows:

Wheat: In facultative wheat the varieties Pamir-94, Kauz, Rana-96, Roshan-96, Gul-96, Takhar-96 and Maiwand-97 have been released and recommended to farmers in the country for irrigated production. These genotypes are out yielding the previously introduced wheat variety Pirsabak-85 by 9 % to 30 %. These varieties have exhibited resistance response to the prevailing races of stripe rusts in the country. For rainfed conditions two varieties by the name Dayma-96 and Ghori-96 have been released and recommended to farmers in the rainfed wheat production areas of the country. In 1997-98 crop season, the project has produced early generation seed of Pamir-94 (14399 kg), Kauz (5539 kg), Gul-96 (2426 kg), Rana-96 (2771 kg), Roshan-96 (4699 kg), Takhar-96 (2411 kg), Maiwan-97 (100 kg), Dayma-96 (2076 kg) and Ghori-96 (962 kg).

The impact of these varieties is impressive. In 1997 the project distributed 2310 kg seed of variety Takhar-96 to farmers and in 1998 the farmer to farmer exchange of this variety was 32828 kg in addition to what they have kept for themselves. In the case of Dayma-96, the distribution was 1400 kg and the exchange was 10810 kg. The FAO/WFP Crop and Food Supply Assessment Mission of July 2, 1998 reported an overall increase in cereal production that is estimated at 3.85 million tones. The wheat component of this estimate was 2.83 million tones. If peace and normalcy returns to the country and the availability of inputs does not become a limiting factor, food self sufficiency can be achieved again in the country.

From the rate of fertilizer trial that was conducted on wheat variety Gul-96, Kauz, and Pamir-94 in six zone over two years, the data revealed that the mean highest yield (6050 kg/ha) was produced by treatment N_2P_2 (115 kg/ha of N and 92 kg/ha of P_2O_5) followed by N_2P_1 (115 kg/ha of N and 46 kg/ha of P_2O_5) with a yield of 5800 kg/ha. The treatment N_1P_1 (57 kg/ha of N and 46 kg/ha of P_2O_5) produced 5476 kg/ha. These yields represent 59%, 53% and 45% increase over no fertilizer treatment (3779 kg/ha) under the experiment conditions. The yields under no fertilizer treatment seems high and the reason for this is that the experiment has been conducted on farmer's fields with variable fertility status. If fertilizer availability and affordability is not limiting factor then the above rates in their order of yields are the ones that should be used by farmers on wheat. The net mean economic gain due to fertilizer use has been in the same order of increments (Tables 25 and 26, Annex 2) .

The date of sowing experiment on wheat in low elevation (Balkh, Herat, Kandahar, Kunar, Laghman, Nangrahar) provinces of Afghanistan showed that the optimum date of planting

Table 17. Mean yield over 3 replication (Kg/ha) of 24 lines from the Regional Bread Wheat Yield Trial Semi Arid Environment 95-96 tested by FAO in Afghanistan in two locations.

No	Name	Baghlan		Takhar		Overall mean		
		Yield	R	Yield	R	Yield	R	% L. C.
1	Mexipak 65	472	4	948	23	710	17	100
2	Tevee-2	449	5	1253	11	851	7	120
3	Towpe	534	2	1267	10	901	5	127
4	Kaby	508	3	1567	3	1038	2	146
5	Florkwa-1	424	10	1456	4	940	3	132
6	Vee's'/Nac	381	12	1318	8	850	8	120
7	Bocro-4	279	21	1133	15	706	19	99
8	Prew	279	22	1117	16	698	20	98
9	Yamama	400	11	1056	18	728	16	103
10	Flk's/Hork/6/WA4767/391//56D.81-14.53/3/1015.6410/4/W22/5/A	301	20	961	22	631	23	89
11	Condor's'/Ald's'5/Gv/4/D6301/Nai//Wrm/3/Cno*3/Chr	349	14	1222	12	786	14	111
12	Cham-6 (improved check)	342	15	1052	19	697	22	98
13	Bow//Buc/Bul/3/Kauz	242	24	1367	6	805	12	113
14	Irena	329	17	1339	7	834	9	117
15	Tracha-1	448	7	1672	1	1060	1	149
16	Mon's'/Cndr's'//Prl's'	328	18	1383	5	856	6	120
17	Momtaz	449	6	1191	13	820	11	115
18	Nac/Vee's'	276	23	1578	2	927	4	131
19	Seri-82/5/Anza/3/PI/Nar//Hys/4/Vee's	324	19	1072	17	698	21	98
20	Henne/Pgo	556	1	1037	20	797	13	112
21	Vee's'//Bow's'/Crow's'	428	9	113	24	271	24	38
22	Bow's'/Sudan #1	331	16	1156	14	744	15	105
23	Cham-5 (durum check)	357	13	1300	9	829	10	117
24	National check	430	8	987	21	709	18	100
	Location mean kg/ha	384		1189				
	LSD at 5 %	388		174				
	C.V. %	19.19		27.54				
	% L. C. = % of long term check (Maxipak-65)	R= Rank						

Table 18. Mean yield (kg/ha) and rank of 40 wheat lines of 16th Elite Selection Wheat Yield Trial from CIMMYT tested in Nangrahar, Afghanistan during 1995-96.

NO.	NAME	Yield	Rank	% N. C.
1	PIRSABAK-85	2290	37	100
2	SERI M 82	2270	38	99
3	ATTILA	2845	34	124
4	WEAVER(CM90320-A-1B-5Y-0B-6M-0Y-OKEN)	3717	11	162
5	RAJ1771	3867	9	169
6	CATBIRD	2857	33	125
7	PRLII/CM65531	4000	7	175
8	RAJ1777	4195	4	183
9	NL 623	3065	28	134
10	PASTOR	4380	2	191
11	SW91-12331	1857	40	81
12	PRINIA	3202	23	140
13	TIA.3	3100	26	135
14	BACANORA T 88	4612	1	201
15	HD 2329	3617	13	158
16	PAT10/ALD//PAT72300/3/PVN/4/URES/5/PFAU	3667	12	160
17	URES/JUN//KAUZ	3567	15	156
18	WEAVER	3405	19	149
19	IRENA	4065	5	178
20	KAUZ*2/MNV//KAUZ	3437	17	150
21	TURACO/CHIL	2860	32	125
22	URES/JUN//KAUZ	3407	18	149
23	LUAN	3297	21	144
24	KAUZE*2/YACO//KAUZ	4005	6	175
25	KAUZ/GEN	3050	29	133
26	TIA.1	2780	35	121
27	LUAN	2047	39	89
28	PARUS	3162	25	138
29	BAVIACORA M 92	3607	14	158
30	KAUZ/GEN	3765	10	164
31	KAUZ*2/OPATA//KAUZ	4227	3	185
32	PRLII/CM65531	3910	8	171
33	TRAP#1/BOW//PFAU	3447	16	151
34	BL 1496	3317	20	145
35	SW89.1862	3257	22	142
36	NL 682	3097	27	135
37	MS SONG	3200	24	140
38	BL 1135	3000	30	131
39	SW89.3243	2955	31	129
40	SW91-12331	2667	36	116
	Location mean	3327		
	LSD at 5 %	1100		
	C.V. %	16.34		
	% N. C. = % National check (Pirsabak-85)			

Table 19. Mean yield (kg/ha) and rank of 30 bread wheat lines of 3rd Heat Tolerance Wheat Yield Trial from CIMMYT tested in Nangrahar, Afghanistan during 1995-96.

NO.	NAME	Yield	Rank	% N. C.
1	PIRSABAK-85	2355	27	100
2	KAUZ	2747	20	117
3	PRINIA	2900	18	123
4	CETTIA	2240	29	95
5	KAUZ*2/BOW//KAUZ	4385	1	186
6	ND/VG9144//KAL/BB/3/YACO/4/CHIL	1917	30	81
7	KAUZ*2/TRAP//KAUZ	4255	2	181
8	ATTILA	3310	8	141
9	URES/JUN//KAUZ	3200	12	136
10	CETTIA	2987	16	127
11	CAR422/ANA//URES	3127	14	133
12	KAUZ*2//TC*6/RL5406(RL6043)/3/KAUZ	3592	7	153
13	OPATA/MANGO	2345	28	100
14	CETTIA	2630	23	112
15	KAUZ*2//DOVE/BUC/3/KAUZ	3710	6	158
16	URES/JUN//KAUZ	2960	17	126
17	CETTIA	2712	22	115
18	RHEA	2725	21	116
19	KAUZ*2/FN//KAUZ	2492	26	106
20	KAUZ*2/BOW//KAUZ	4062	5	172
21	FANG 60	3265	10	139
22	KAUZ*2/TRAP//KAUZ	2895	19	123
23	PRINIA	4152	4	176
24	TOB//HD832/BB/3/MON/4/BUC	3177	13	135
25	KAUZ*2/YACO//KAUZ	3112	15	132
26	CMH80A.542/CN079	2540	24	108
27	PATIO/ALD//PAT72300/3/PVN/4/URES/5/PFAU	3290	9	140
28	IRENA	3265	11	139
29	PARUS	2535	25	108
30	KAUZ*2/MNV//KAUZ	4177	3	177
	Location mean kg/ha	3102		
	LSD at 5 %	17.17		
	C.V. %	27.06		

Table 20. Mean Yield (kg/ha) and rank of 30 facultative and winter wheat lines of 2nd FWWYT tested in Takhar, Afghanistan during 1995-96 by FAO.

NO.	NAME	Yield	R	% N. C.
1	PIRSABAK-85	5417	27	100
2	HYS//R37/GHL121/3/PRL/VEE#6	6056	8	112
3	JUP/4/CLLF/3/II14.53/ODIN//CI13431/WA00477	6444	3	119
4	VORONA	4639	30	86
5	IC80.49	5597	18	103
6	PYN/BAU	5583	19	103
7	ASP/BLT	5111	29	94
8	NAI60/HEINE VII//BUC	6097	7	113
9	BATERA	5542	21	102
10	TX71A1039.V1*3/AMI	6028	9	111
11	PEETHREE NR2/2*OS//NWT/3/OS.VONA PYNCOMP	5793	13	107
12	WRM/4/FN/3*TH//K58/2*N/3/MY54/N108//AN/5/PEL 72380/ATR7	5886	12	109
13	KSB2117/MLT	5490	24	101
14	PYN/BAU	6550	2	121
15	SDY/SERI	5333	28	98
16	HYS/CNDR//VEE#5	5465	25	101
17	TJB916.46/CB306//2*MHB/3/BUC	6632	1	122
18	TX71A1039.V1*3/AMI	5722	15	106
19	NEMURA	5681	16	105
20	NAI60/HEINE VII//BUC/3/F59.71/GHK	5444	26	100
21	PI/FUNO*2//VLD/3/C0723595	6422	4	119
22	ORIGMA	5514	23	102
23	TX71A1039.V1*3/AMI	5965	10	110
24	TAM 200	6131	5	113
25	VORONA	5750	14	106
26	MONARCHA	5535	22	102
27	SAULESKU #43	5965	11	110
28	KAL/PMFN/3/7C/CNO67//CAL	5681	17	105
29	CSM*3/3/NTN//LGO/CSM	5583	20	103
30	TX71A1039.V1*3/AMI	6128	6	113
	Location mean kg/ha	5773		
	LSD at 5 %	955		
	C.V. %	8.09		

R= Rank , % N. C. = % of National check (Pirsabak-85)

Table 21. Mean yield (kg/ha) and rank of 49 durum whea lines tested in Nangrahar, Afghanistan during 1995-96 by FAO.

NO.	NAME	YIELD	R	NO.	NAME	YIELD	R
1	PIRSABAK-85	1987	48	26	MQUE/4/USDA573//QFN/AA-7/3/ALBA-D/5/AV	3575	10
2	BACANORA T 88	4150	2	27	MQUE/4/USDA573//QFN/AA-7/3/ALBA-D/5/AV	1312	50
3	LAMB-2	2262	47	28	MUSK-3	2475	45
4	MEX175	3025	35	29	MUSK-8	3050	34
5	YAVAROS 79	3500	13	30	ODIN-19	3275	21
6	ALTAR 84	3600	8	31	PLATA-16	3262	25
7	OCEAN-2	3100	31	32	PLATA-18	3300	19
8	AJAIA-2	4125	3	33	PLATA-2	3075	32
9	AJAIA-5	3262	24	34	SHAG-5	4050	4
10	ALTAR 84/SHL	3580	9	35	SHAG-7	2662	41
11	ANSER-5	2625	44	36	SHIP-1	2775	40
12	BOOMER-16	3125	29	37	SILVER-13	2850	38
13	BUSHEN-6	3700	6	38	SILVER-15	3400	16
14	PARVA-1	3125	30	39	SOOTY-11	3275	22
15	PARVA-2	3425	15	40	SOOTY-13	3275	23
16	DUKEM-15	3250	26	41	SPOT-2	4650	1
17	FOCHA-1	3150	27	42	SRN-2//YAVAUS/HUI	3300	20
18	GREEN-22	2650	42	43	SRN-1/6/FGO/DOM//NACH/5/ALTAR84/4/GAR	1825	49
19	GREEN-35	2275	46	44	CAMPESTRE-4	3325	17
20	GREEN-36	3300	18	45	STIL/YAV79//PEN	3475	14
21	GRVAND-2	3000	36	46	MINIMUS-5	3575	11
22	KIRKI-8	3137	28	47	MINIMUS-2	3550	12
23	LOTUS-1	2775	39	48	TOPDY-6	3650	7
24	LOTUS-5	3937	5	49	TRINGA/3/GS/FGO//CNDO/4/SRN-1	2650	43
25	MOJO-2	3000	37	50	WITNEK-1	3075	33

Location mean kg/ha 3155
LSD at 5 % level 1792
C.V. % 28.26
R= Rank

Table 22. Mean Yield (kg/ha) and rank of 49 triticale lines of 27th ITYN tested in Nangrahar, Afghanistan during 1995-96.

No.	Name	Yield	R	No.	Name	Yield	R
1	PIRSABAK-85	2300	27	26	ERIZO-10/BULL-1-1	1416	48
2	GENARO T 81	2725	15	27	ERIZO-12/NIMIR-3//GIRAF/Y	2608	20
3	CANANEA 79	1758	44	28	FAHAD-1	2566	21
4	ALAMOS 83	2666	16	29	FAHAD-5	1683	46
5	BEAGLE-1	2783	13	30	FAHAD-8-2	1883	40
6	ERONGA 83	3308	4	31	FD-693/2*FAHAD-4	2950	10
7	150.83/2*WALRUS-1	2081	34	32	GAUR-3/ANOAS-2//BANT-1	2666	17
8	274/320//BGL/3/MUSX/LYNX/	1850	41	33	GIRAF/YOGUI-1//FARAS-1/3/	2320	26
9	6TA876/6TB164//PNO-T/RHM/	1225	49	34	KISSA-7	2233	29
10	ABN//M2A/IGA42/3/BOK/4/EF	2820	12	35	KISSA-7-1	3141	8
11	ABN//M2A/IGA42/3/BOK/4/EF	2653	18	36	LIRNO-1	2475	23
12	ANOAS-3/TATU-4	2905	11	37	MANATI-1	2200	30
13	ARDI-1/TOPO 1419//ERIZO-9	1641	47	38	MT7377/BAT//RHINO-9	2113	32
14	ARDI-1/TOPO 1419//ERIZO-9	2041	35	39	PAPION 4	2408	24
15	BAGAL-4/ERIZO-12	1800	43	40	PREST//2*TESMO-1/MUSX 60	3058	9
16	BUF-4//JLO 97/CIVET/3/LAM	3241	6	41	PTR/CSTO//BGLT/3/RHINO-4	2016	36
17	BULL-10/MANATI-1	1983	38	42	RHINO-3/BULL-1-1	2400	25
18	CMH77A.1024/2*YOGUI//LAN	1825	42	43	RHINO-3/BULL-1-1	3675	2
19	CMH77.1135/CMH77A.1165//2	2141	31	44	RHINO-3/BULL-1-1	2783	14
20	COPI-1	1966	39	45	RONDO/2*ERIZO-11	2558	22
21	CT775.81/ARDI-1//ANOAS-1	3250	5	46	RONDO/BANT-5//ANOAS-2	2008	37
22	DAGRO/IBEX//CIVET*2	3425	3	47	RONDO/BANT-5//ANOAS-2	1693	45
23	DAGRO/IBEX//CIVET*2	3741	1	48	SANDRO	2241	28
24	DAGRO/IBEX//CIVET*2	3150	7	49	SUSI-2	2650	19
25	DAMAN-10	2091	33				

Location mean kg/ha 2431
LSD at 5 % 1359
C.V % 27.8

Table 23. Mean yield (kg/ha) and rank of 40 wheat lines from 3rd SAWYT tested under rainfed conditions in Dashti-Qala of Takhar province in Afghanistan during 1995-96 by FAO.

NO.	NAME	YIELD	R	NO.	NAME	YIELD	R
1	PIRSABAK-85	605	11	21	HD2206/HORK//BUC/BUL	518	21
2	PROINTA FEDERAL	292	40	22	PFAU/VEE#9	467	27
3	HYBRID DELHI RAINFED 77	468	26	23	SARA//JUP/BJY	697	5
4	OPATA M 85	338	36	24	OR791432/VEE#3.2	717	4
5	HI.1077	445	28	25	IRENA	603	13
6	GAMTOOS	603	12	26	BABAX	602	14
7	OR791432/VEE#3.2	760	2	27	CETTIA	637	8
8	FILIN	380	33	28	CHIL//ALD/PVN	487	24
9	REDWING	475	25	29	CHIL/PRL	330	38
10	BABAX	568	15	30	CHIL/BUC	437	29
11	CHIL/PRL	527	19	31	PFAU/VEE#9//URES	523	20
12	BJY/COC//PRL/BOW	655	7	32	KAUZ//PRL/VEE#6	408	32
13	PAVON F 76	535	18	33	PIK/OPATA	417	31
14	DHARWAR DRY	568	16	34	BJY/COC//PRL/BOW	560	17
15	NESSER	487	23	35	CHIL/WUH3	343	35
16	SITTA	633	9	36	URES//BUC/FLK/3/KAUZ	518	22
17	FIRETAIL	338	37	37	ARIVECHI M 92	320	39
18	PFAU/BOW//VEE#9	752	3	38	TJB368.251/BUC//OCI	832	1
19	PASTOR	377	34	39	TIA.1	435	30
20	SARA/THB//VEE	673	6	40	RL6043/4*NAC	633	10
	Location mean	524					
	LSD at 5 %	279					
	C.V %	26.29					
	R= Rank						

Table 24. Summary of data of 25 wheat lines included in 1996 elite wheat yield trial from CIMMYT/Tureky in 1995-96 under irrigated conditions by F. A. O. in Wardak province of Afghanistan

NO.	NAME	Winter kill	Rust			DTH	PHT	PM1-9	L.BLO	Yield	R
			stripe	leaf	stem						
1	BEZ	42	10S	0	0	188	90	2	0	5850	16
2	ATAY85	24	5MS	0	0	188	100	0	0	8850	1
3	KATIA1	0	5S	5MR	5MR	187	96	2	0	7875	3
4	SULTAN95	35	5MS	5MS	5S	194	84	0	1	4937	23
5	GUN91	23	20S	5MS	5MR	188	100	0	0	5562	20
6	LOCAL CHECK	21	5S	0	0	193	89	1	0	6562	9
7	DAGDAS	15	10S	0	0	1189	115	1	0	7050	5
8	BHR*5/AGA//SNI/3/TRK13	19	5MS	5MS	0	188	87	1	0	7675	4
9	F10S-1	36	5MR	10S	40S	187	70	0	1	5062	22
10	YMH/TOB//MCD/3/LIRA(BDM	32	0	0	0	187	84	0	1	4750	25
11	ABN/JUN	15	10S	0	0	185	88	0	0	5812	17
12	KS82142/CUPE	37	5MR	5R	0	188	91	0	0	8337	2
13	ZCL/3/PGFN//CNO67/SON64(	15	10R	5MR	0	190	87	0	0	6525	10
14	HYS/7C//KRC(ES84-16)/3/SER	35	10S	0	0	185	80	0	1	4875	24
15	JUP/4/CLLF/3/II14.53/ODIN//(	0	0	5MR	0	187	94	0	2	5992	13
16	NS55-58/VEE	32	5S	5MS	0	188	87	1	0	5812	18
17	PCK/VEE	6	60S	0	0	187	80	0	0	6437	11
18	SN64//SKE/2*ANE/3/SX/4/BEZ	38	5S	0	0	180	72	0	0	5937	14
19	SN64//SKE/2*ANE/3/SX/4/BEZ	57	5S	0	0	186	76	0	1	5812	19
20	SN64//SKE/2*ANE/3/SX/4/BEZ	25	0	5R	5MR	189	97	0	1	6812	7
21	CO724377/NAC//SERI	52	0	5MR	0	185	77	1	0	6750	8
22	JI NAN785019//TJB368.251/BU	27	100S	0	0	190	91	0	0	6187	12
23	PTZ NISKA/UT1556-170	15	5MS	5MS	0	188	77	1	0	5937	15
24	TJB788-1089/ALDAN//PEX/TC	12	5S	0	0	188	67	0	1	7037	6
25	HYS/NCO//7C/3/SPN//63-189-(	49	5MS	20S	10S	193	80	0	0	5125	21

LOCATION MEAN 6303
LSD AT 5 % 2197
C.V. % 16.9
DTH = days to heading, PHT= Plant height, PM = Powdery meldew, L.BLO = Leaf blotch

Table 25. Summary of yield date (Kg/ha) of 25 lines included in the 96 elite wheat yield trail from CIMMYT tested in 1995-96 in Balkh under rainfed conditions by FA O in Afghanistan .

NO	Name or pedigree	Yield	Rank
1	BLL		
2	GRK	383	16
3	DAGDAS		
4	KUTLUK	369	17
5	SEFID		
6	KATIA1	760	1
7	PIRSABAK-91	632	6
8	ECVD12/KAUZ/UNKNOWN	514	12
9	DMN//SUT/AG(ES86-7)/3/OPATA/4/TX71A10	355	18
10	ID13.1/MLT		
11	KS79441/SERI	655	5
12	KS79441/SERI	555	11
13	KS82142/CUPE	449	14
14	KS82214/GALVEZ87		
15	RAN/NE701136//CI13449/CTK/3/CUPE		
16	VORONA/CUPE	626	9
17	HYS/7C//KRC(ES84-16)/3/SERI	630	7
18	SN64//SKE/2*ANE/3/SX/4/BEZ/5/SERI	736	2
19	SN64//SKE/2*ANE/3/SX/4/BEZ/5/SERI	672	4
20	PJ/HN4//GLL/3/SERI	628	8
21	PTZ NISKA/UT1556-170		
22	TAST/SPRW//ZAR	567	10
23	PATO/CAL/3/7C//BB/CNO/5/CAL//CNO/SN64	732	3
24	ZAR//71ST2959/CROW	511	13
25	DYBR86.1/CHAM6	432	15

Annex 2
Wheat data 1996-97
(Tables 1-30)

for facultative wheat is from 15 October to end of November. The average yield for these locations at the end of November is 4923 kg/ha and every two weeks delay in date of planting will result in yield reduction of 18. 69 and 187 kg/ha/day. Similarly in high elevation, cooler areas such as Ghazni. the optimum sowing time is the month of October. Delaying planting wheat for each two weeks after October will result in yield reduction of 225 to 256 kg/ha/day. This is an unnecessary yield loss that farmers are experiencing and should be communicated to them via extension service.

Rice: Rice is an important crop in North, North East, North West and Eastern part of the country. The combined over years and location data on both short and long grain rice varietal screening revealed that in short grain rice, the variety Swat-2 has out yielded the local variety by 30%. It has produced an average yield of 7 Mt./ha over 17 locations and is widely adapted. In the medium size grain rice, the line RP 1670-7613-3-2 became top yielding (6776 kg/ha) over years and locations. It has out yielded the local check by 49%. In the long grain rice category, the line IR62871-166-2-2 produced an average yield of (5865 kg/ha) in 17 locations. This is the second top yielding rice line and has produced 22 % higher grain yield than the local check. In 1998 the project has produced and distributed 6200 kg seed of line RP1670-7613-3-2 and 80 kg seed of IR62871-166-2-2 to farmers in Takhar, Kunduz and Baghlan provinces for further multiplication.

Barley: Summary of barley varietal screening over years and locations identified four lines that have out yielded the local variety by 10% to 13%. These lines are: 1. IBRAN / UNA8271 // GLORIA-BAR / COME-813 / 3 / SEN, 2. TROMPILO-BAR, 3. GLORIA-BAR / COME-8 // ORGE FICHEDRET 3270, 4. LIBRAN / UNA 80 // LIGNEE 640 / 3 / GLORIA-BAR. These lines are recommended for multiplication in 1998-99 crop season. The project has produced and distributed 1526 kg seed of line 3 and 608 kg seed of line 4 for pre-basic seed production in different locations in the country.

Maize: Summary of data over years and location for both high and low elevation areas showed that the maize varieties EV-II and Shaheen are suitable for high elevations such as Ghazni, Logar, Wardak, Kabul, Kapisa and Parwan provinces. These varieties have produced 111 % and 104 % higher yields than the local variety. For warmer areas, the maize variety Azam gave 60 % higher yield than local variety. Maize varieties Kissan, Sarhad Yellow and Sarhad White performed well in both high and low elevation environments and have out yielded the local by 65%, 60% and 22% respectively.

Food legumes: The project has screened germplasm of beans, chickpeas and lentils for adaptability and yield in the country. Data summary showed that kidney bean 5229 UI with bush growth habit, Arapaho, a pinto climbing type, Co 1760 great northern type with bush growth habit and variety Viva, red kidney bean with bush type growth habit are the top yielding varieties. Their yield is 56%, 50%, 41% and 75% higher than the local beans. These lines are considered for multiplication and distribution.

In chickpea two lines (FLIP 93-93 and ILC-482) have been identified as top yielding, cold tolerant and resistant to ascochyta blight. These lines are under multiplication in Tahkar, Balkh and Herat provinces for early generation seed production. Their yields are 52% and 14% higher than the local varieties.

In lentils two lines (78S 26002 and FLIP 92-15L) are high yielding and have been recommended for multiplication in Herat, Balkh and Takhar provinces. The yielding ability of these lines is 23 % and 21 % higher than the local variety.

Table 1. Summary of mean yield (kg/ha) data and rank of 15 bread wheat lines tested in National Wheat Yield Trial (96NWYT1) in six locations during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations, yield and rank												Overall mean		
		Nangrahar		Kandahar		Herat		Balkh		Takhar		Ghazni				
		Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	Yield	R	% N.M
1	VEE#7/OPATA= Takhar-9(	4992	1	3390	15	5834	12	6042	5	6375	6	6550	9	5531	8	98
2	PAMIR-94(YMH/TOB/MCI	4177	7	5070	9	6617	1	6015	6	5941	8	7905	5	5954	4	106
3	Kauz	4546	3	4190	14	6125	5	6233	2	6849	2	6405	10	5725	6	102
4	BLL/SERI (94PWYT2 #5)	3951	11	5828	4	6480	2	5459	8	5425	11	8500	2	5941	5	106
5	ID800994.W/VEE (94PWY'	4146	8	5041	11	6354	4	6219	3	6819	3	7687	6	6044	2	107
6	BLOUNDANL/3/Bb/7C*2//	4882	2	5916	3	6090	8	6124	4	6531	5	8217	3	6293	1	112
7	K2340/SX//MT/GB/3/K340/	4261	6	6132	1	6379	3	4210	15	2628	15	8125	4	5289	13	94
8	F13471/CROW"s"	3975	10	5059	10	6087	7	5461	7	5386	12	6387	11	5393	12	96
9	TI/PCH/5/MT48/3/WT*3//N	3639	14	5459	7	5654	14	5369	11	5750	9	6625	8	5416	11	96
10	KVZ/TI 71/3/MAYA"s"//IN	2401	15	5269	8	5753	13	5316	12	4859	14	9062	1	5443	9	97
11	HD2329	4539	4	4804	13	5584	15	5382	10	6699	4	5500	14	5418	10	96
12	PIRSABAK-85	4314	5	5584	5	5990	10	6411	1	7450	1	6375	12	6021	3	107
13	HD2232 (Balkh 66)	3805	13	6035	2	5889	11	5421	9	6097	7	6667	7	5652	7	100
14	HD2285	3995	9	5506	6	6101	6	5042	13	5152	13	5585	13	5230	14	93
15	PBW154	3892	12	4990	12	6040	9	4668	14	5699	10	5000	15	5048	15	90
	LSD AT P= 5%	670		1110		992		794		1122		788				
	% C.V.	11.45		14.91		11.4		10		13.5		7.9				
	Site mean	4101		5218		6067		5558		5844		6973		5627		

% N.M. = % of nursery mean over locations

Table 2. Summary of mean yield (kg/ha) data and rank of 10 bread wheat lines tested in National Wheat Yield Trial (96NWYT2) in six locations during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations, yield and rank														% of
		NGR		KDR		HRT		BLK		TKR		GZN		Mean		
		YLD	R	YLD	R	YLD	R	YLD	R	YLD	R	YLD	R	YLD	R	N.Mean
1	PAMIR-94 (YMH/TOB/MCD/3/LIRA SWM16#48)	3579	5	4707	5	5678	2	6058	1	5987	8	7867	2	5646	1	109
2	PAYON76	3917	2	4730	4	5076	4	5338	5	6374	3	7542	3	5496	2	106
3	TEB/CEEP7780	3794	3	4141	7	4474	9	4837	9	5969	9	6662	5	4980	7	96
4	NL360	4150	1	3637	10	4609	8	4962	8	7121	2	5780	8	5043	6	97
5	JUP/BOY	3382	7	4122	8	4367	10	5349	4	5997	7	5512	9	4788	10	92
6	HD2307	3288	8	3937	9	6002	1	5605	2	6201	5	4017	10	4842	9	93
7	ANZA/KATYA A1	2679	9	4761	3	5657	6	5544	3	5753	10	8017	1	5402	3	104
8	HAW-19/5/CNN/KKV//KC66	3763	4	4798	2	5177	3	5206	6	6184	6	6625	6	5292	5	102
9	SN64//SKE/2*ANE/3/SX/4/BEZ/5/SERI	2179	10	4909	1	5013	7	4147	10	6337	4	7262	4	4975	8	96
10	CO724377/NAC//SERI	3429	6	4284	6	5069	5	5176	7	7577	1	6605	7	5357	4	103
	LSD AT 5%	896		1122		1252		667		1116		1009				
	% C.V.	18		17.5		16.9		8.8		12.1		10.5				
	NURSERY MEAN	3416		4402		5112		5222		6350		6589		5182		

% N.M. = % of nursery mean over locations

NGR = Nangrahar, KDR= Kandahar, HRT= Herat, BLK= Balkh, TKR= Takhar, GZR= Ghazni, R= Rank.

Table 3. Summary of mean yield (kg/ha) data and rank of 10 bread wheat lines tested in National Wheat Yield Trial (96NWYT3) in six locations during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations														% of
		HRT	R	BLK	R	TKR	R	GZN	R	LGR	R	WRD	R	MEAN	R	N. Mean
1	ATAY-85 (HYS/7C)	5132	5	4305	9	3669	10	7437	2	5000	4	5330	9	5146	8	95
2	PAMIR-94(YMH/TOB/MCD/3/LIRA SWM16#48)	5001	7	5637	2	5309	5	7237	5	5487	1	5880	6	5759	1	106
3	NAI60/HN7//BUC/5/F59.71/4/..	5185	4	5399	4	4587	7	6217	10	4237	10	4767	10	5065	9	93
4	CA8055/6/PATO(R)/CAL/3/7C//BB/CNO/5/CAL/CNC	5564	2	5506	3	4314	8	6992	6	4875	6	5980	3	5539	5	102
5	NS55-58/VEE	4921	8	4486	8	5587	4	6512	8	4737	7	6080	1	5387	7	99
6	SN64//SKE/2*ANE/3/SX/4/BEZ/5/SERI	5003	6	3757	10	3912	9	7375	3	4267	9	6025	2	5057	10	93
7	CO724377/NAC//SERI	5813	1	5247	5	5175	6	6625	7	5017	3	5925	5	5634	4	104
8	BHR*5/AGA//SNI/3/TRK13	4811	10	4548	7	5675	3	7780	1	5050	2	5362	8	5538	6	102
9	KS82142/CUPE	4904	9	4614	6	6005	2	7367	4	5000	5	5930	4	5637	2	104
10	LOCAL CHECK	5466	3	5859	1	6292	1	6325	9	4437	8	5425	7	5634	3	104
	LSD AT 5%	948		4936		1153		1400		533		961				
	% C.V.	12.6		11		16		13.8		7.6		11.7				
	NURSERY MEAN	5180		798		5053		6987		4811		5670		5439		

% N.M. = % of nursery mean over locations

NGR = Nangrahar, KDR= Kandahar, HRT= Herat, BLK= Balkh, TKR= Takhar, GZR= Ghazni, R= Rank.

Table 4. Summary of mean yield (kg/ha) data and rank (R) of 15 bread wheat lines tested in National Rainfed Wheat Yield Trial (96NRFWYT4) in four locations under rainfed conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Yield kg/ha, data of 1996-97 season										% N. Mean
		HRT1	RNK	HRT2	RNK	BLK	RNK	TKR	RNK	MEAN	RNK	
1	KVZ/BJY's'	1096	2	552	14	743	5	1178	4	892	3	107
2	HD2206/HORK//BUC/BUL	641	11	500	15	654	9	1209	2	751	14	90
3	PRL"s"/PEW	1114	1	1192	1	604	11	1062	9	993	1	119
4	CHIL/WUH3	586	14	949	7	712	6	344	15	648	15	77
5	NAC/3/STW63	859	3	694	13	777	4	1100	6	858	6	103
6	DAGDAS	654	10	1089	3	687	8	812	14	811	10	97
7	VEE's'/S/SKh8/4/RRV/WW15/3/B	764	5	1070	4	554	13	1066	7	864	5	103
8	TRACHA-1	636	12	994	5	649	10	1019	11	825	9	99
9	KABY	719	8	772	11	705	7	1181	3	844	7	101
10	FLORKWA-1	759	6	974	6	511	14	919	13	791	13	95
11	NAC/VEE"s"	722	7	924	9	837	2	1062	8	886	4	106
12	TOWPE	705	9	895	10	579	12	1036	10	804	12	96
13	MON"s"/CNDR"s"//PRL"s"	630	13	758	12	846	1	1103	5	834	8	100
14	TEVEE-2	583	15	1157	2	484	15	1006	12	808	11	97
15	LOCAL CHECK	787	4	935	8	789	3	1244	1	939	2	112
	LSD AT 5%	280		327		168		224				
	% C.V.	26		25.6		17.5		15.3				
	NURSERY MEAN	750		897		675		1023		836		

% N.M. = % of nursery mean over locations

HRT1= Khowaja Malal of Herat, HRT2= Dezwari of Herat, BLK= Balkh, TKR= Takhar,

Table 5. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Advance Wheat Yield Trial (96AWYT1) in six locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No.	Name or pedigree	Locations														% of
		NGR	R	KDR	R	HRT	R	BLK	R	TKR	R	GZN	R	Mean	R	N.M
1	MYNA/VUL//PRL	5197	3	4037	9	6566	2	5229	10	6698	5	7930	6	5943	2	107
2	KAUZ/GEN	4208	13	4108	5	5916	6	5293	8	6556	11	7042	9	5521	9	100
3	TURACO/CHIL	4844	7	4096	7	6566	1	5491	4	5823	13	7705	7	5754	5	104
4	ATILA	4834	9	2919	15	5931	5	5469	6	7042	3	8187	3	5730	6	104
5	PASTUR	5031	5	4101	6	6171	3	5709	3	6914	4	7037	10	5827	4	105
6	ND/VG9144//KAL/BB/3/YACO/4/CHIL	5258	2	4135	4	5156	13	5959	1	7053	2	5667	14	5538	7	100
7	OPATA/KILL//PRL/VEE#6	4459	12	3317	13	4841	15	5224	11	6562	10	7550	8	5326	12	96
8	TIA.2	4901	6	3259	14	5007	14	5365	7	6669	6	5875	13	5179	13	94
9	PAMIR-94(YMH/TOB/MCD/3/LIRA SWM1	5378	1	4473	3	5631	10	4909	12	6652	7	8687	1	5955	1	108
10	AGRI/NAC/LIRA	3256	15	3708	11	5722	8	3913	14	4629	15	7967	5	4866	15	88
11	AGRI/NAC	3814	14	3722	10	5396	12	3709	15	4681	14	8350	2	4945	14	89
12	LOCAL CHECK	5102	4	4996	1	5419	11	5822	2	7084	1	4750	15	5529	8	100
13	TR"s"380-16-3AB-/4/CHOT"s"	4803	10	4727	2	5858	4	5474	5	6620	8	8050	4	5922	3	107
14	BUC/FLR//MYANA/VOL	4527	11	4092	8	5749	7	4836	13	6602	9	6987	11	5466	11	99
15	ESDA/KAUZ	4836	8	3499	12	6304	9	5242	9	6237	12	6750	12	5478	10	99
	LSD AT 5%	590		1374		1140		735		866		887				
	% C.V.	8.8		24.4		13.9		9.96		9.5		8.4				
	NURSERY MEAN	4696		3946		5749		5176		6388		7236		5532		

% N.M. = % of nursery mean over locations

NGR = Nangrahar, KDR= Kandahar, HRT= Herat, BLK= Balkh, TKR= Takhar, GZR= Ghazni, R= Rank.

Table 6. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Advance Wheat Yield Trial (96AWYT2) in six locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations														% of N.M
		NGR	R	KDR	R	BLK	R	HRT	R	TKR	R	GZN	R	Mean	R	
1	OPATA/CUPE	4199	9	4774	5	5732	4	5624	4	6522	4	5375	11	5371	5	103
2	MN 751136/PGO	4286	7	4496	7	5347	9	5181	11	5519	12	4867	15	4949	12	95
3	KAUZ/OPATA//KAUZ	3875	12	3893	13	6104	1	5657	3	6500	5	6262	6	5382	4	104
4	TOB//HD832//BB/3/MON/4/BUC	4013	10	5285	3	4462	13	4877	12	5054	14	5967	8	4943	13	95
5	URES/JUN//KAUZ	5453	1	4461	8	5391	8	5359	7	6547	2	6137	7	5558	3	107
6	LOCAL CHECK	4843	2	4248	11	5402	7	4702	15	6187	10	5687	9	5178	8	100
7	ND/VG9144//KAL/BB/3/YACO/4/CHIL	4012	11	3667	15	4576	12	4741	14	6280	8	5030	14	4718	14	91
8	TJB368.251/BUC//OCI	4582	4	3862	14	5632	5	5412	6	6376	6	5405	10	5212	7	100
9	VEE#8//HD2206/HOR	4366	6	3990	12	5824	2	5312	8	6307	7	5067	13	5144	9	99
10	MAYA/7/H/RA/2F2/3/BB/5*YC//RA/2F2/6/B	4222	8	4519	6	5781	3	5765	2	6536	3	6605	5	5571	2	107
11	PYN/SERI	3556	13	4410	9	4082	14	5196	10	5476	13	7180	1	4983	11	96
12	CLLF/BEZ//SU92/CI13645/3/NA160/4/EMU/	2939	15	4362	10	3814	15	5532	5	4192	15	6712	3	4592	15	88
13	Bb/CON//2073/3/BOW"s"	4818	3	5461	1	5457	6	6041	1	6224	9	7155	2	5859	1	113
14	TEPOEA	3454	14	4956	4	4809	11	5252	9	5697	11	6662	4	5138	10	99
15	ULC/PVN//INA/3/ONC	4566	5	5352	2	4861	10	4772	13	6862	1	5342	12	5293	6	102
	LSD AT 5%	737		1057		957		772		846		1152				
	% C.V.	12.3		16.4		13		10.2		9.8		13.5				
	NURSERY MEAN	4212		4515		5152		5295		6019		5964		5193		

% N.M. = % of nursery mean over locations

NGR = Nangrahar, KDR= Kandahar, HRT= Herat, BLK= Balkh, TKR= Takhar, GZR= Ghazni, R= Rank.

Table 7. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Advance Wheat Yield Trial (96AWYT3) in seven locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations																% of
		NGR	R	KDR	R	BLK	R	HRT	R	TKR	R	GZN	R	KST	R	Mean	R	N.M
1	BLOUNDANL/3/Bb/7C*2//Y50E/Kal*3	4847	4	4439	5	5846	11	5433	1	6586	1	5687	4	6100	3	5563	2	108
2	BOW"s"/CROW"s"	4313	11	3771	11	6289	3	5056	6	6107	4	4562	13	5897	6	5142	8	100
3	BOCRO-2	4226	12	3604	13	6566	1	4930	7	6454	2	3950	15	5641	9	5053	12	98
4	KAPSW	4212	13	4129	7	5996	7	3925	15	6027	7	4830	9	6000	4	5017	15	97
5	CHAM-4	4451	9	3840	9	6539	2	5119	5	5677	13	4750	10	5422	10	5114	5	99
6	BOCRO-3	4662	7	3997	8	5908	10	4652	8	5879	11	4955	8	5250	13	5043	9	98
7	Bobwhite#1/Fengkang 15	3662	15	4519	3	5972	8	5119	4	6203	3	4625	12	5734	8	5119	7	99
8	picus	4672	6	4766	2	6019	5	5264	3	6031	6	6355	1	6334	1	5634	1	109
9	Gv/Ald's'/5/Ald's'/4/Bb/G11/Cno67/7C/kvz/Ti	4461	8	4468	4	6017	6	5340	2	5696	12	5050	5	4772	15	5115	3	99
10	Maya74's'/On/II60.147/3/Bb/G11/4/Chat's'/5/Mt1's'	4744	5	3622	12	5595	14	4363	12	5556	15	6255	2	5937	5	5153	6	100
11	Fow-1	4357	10	3549	14	5619	13	4556	10	5899	10	5900	3	5328	11	5030	11	98
12	Caskor	5421	1	4351	6	5967	9	4247	14	5946	8	5042	6	6131	2	5301	4	103
13	Dove's'/Inia/4/4777(2)//Fkn/Gb/3/Pvn's'	5151	2	3519	15	5807	12	4304	13	5908	9	4700	11	5303	12	4956	14	96
14	Dove's'/Tsi/5/Gv/4/D6301/Nai/Wrm/3/Cno*3/Chr	4173	14	4969	1	5139	15	4641	9	5590	14	5042	7	5187	14	4963	13	96
15	Local check	5139	3	3809	10	6032	4	4440	11	6063	5	4500	14	5844	7	5118	10	99
	LSD AT 5%	702		1058		800		1167		800		837						
	% C.V.	10.8		18.13		9.42		17.2		9.4		11.5						
	NURSERY MEAN	4566		4090		5954		4759		5975		5080		5659		5155		

% N.M. = % of nursery mean over locations

NGR = Nangrahar, KDR= Kandahar, HRT= Herat, BLK= Balkh, TKR= Takhar, GZR= Ghazni, KST= Khost, R= Rank.

Table 8. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT1) in four locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations										% of
		BLK	R	TKR	R	HRT	R	GZN	R	MEAN	R	N.M
1	HIM/CNDR//CA8055	5451	9	5213	4	4594	3	8400	5	5915	6	105
2	ORE F1.158/FDL//BLO/3/SHI4414/CROW	6362	4	5130	5	4101	8	8246	6	5960	5	105
3	BVD1/HUNZA2	4791	14	3087	15	4093	9	7833	12	4951	15	88
4	CC//CAL/SR/3/KAL/BB/4/PLK70/LIRA	4909	13	4625	7	3858	10	8233	7	5406	10	96
5	RAN/NE701136//CI13449/CTK/3/CUPE	5272	10	3850	14	4845	2	8526	4	5623	8	100
6	SN64//SKE/2*ANE/3/SX/4/BEZ/5/SERI	7250	1	5377	3	4470	4	9113	2	6553	1	116
7	CO724377/NAC//SERI	5812	7	4997	6	5261	1	8646	3	6179	3	109
8	NAI60/HN7//BUC/3/PRL	5211	11	3900	12	3690	12	8133	9	5234	12	93
9	PTZ NISKA/UT1556-170	5091	12	3893	13	3118	15	7860	11	4991	14	88
10	BUL6186.6	7238	2	5425	2	3755	11	7866	10	6071	4	107
11	F474S10.1	6022	5	4588	9	4254	6	8146	8	5753	7	102
12	VONA//KS75210/TAM101	6377	3	4467	10	3460	14	7400	14	5426	9	96
13	SB-360-1	4731	15	4592	8	3498	13	7833	13	5164	13	91
14	ATAY-85 (HYS/7C)	5674	8	4450	11	4170	7	6666	15	5240	11	93
15	PAMIR-94(YMH/TOB/MCD/3/LIRA)	5971	6	5427	1	4363	5	9366	1	6282	2	111
	LSD AT 5%	1080		1196				1264				
	% C.V.	13.17		18.2				10.9				
	NURSERY MEAN	5744		4601		4102		8151		5650		

% N.M. = % of nursery mean over locations

HRT= Herat, BLK= Balkh, TKR= Takhar, GZR= Ghazni, R= Rank.

Table 9. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT2) in two locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations						% of
		BLK	R	TKR	R	MEAN	R	N.M
1	C126.15/COFN/3/N10B/P14//SEL101/4/SKP	4294	13	5017	11	4656	14	89
2	7C/CNO//CAL/3/YMH/4/TAST/TORIM	4595	11	4733	13	4664	13	89
3	JUWEL/LV24//LV32/3/FL80/4/F29/2*LV32//FL80	6219	1	7242	1	6731	1	128
4	WAKEFIELD	5075	9	5167	8	5121	7	98
5	LUT20161	4831	10	5208	7	5020	9	96
6	TJB916.46/C8306//2*MHB/3/BUC	5411	7	5892	3	5652	4	108
7	PYN/BAU	5821	3	5550	4	5686	3	108
8	JUP/4/CLLF/3/II14.53/DDIN//CI13431/WA00477	5729	4	4933	12	5331	6	102
9	PI/FUNO*2//VLD/3/CO723595	4366	12	5275	6	4821	10	92
10	TAM 200	5225	8	4267	15	4746	11	90
11	PYN/BAU	5681	5	5128	10	5405	5	103
12	NAI60/HEINE VII//BUC	3859	15	5475	5	4667	12	89
13	HYS//R37/GHL121/3/PRL/VEE#6	5510	6	4700	14	5105	8	97
14	ATAY-85	4101	14	5150	9	4626	15	88
15	LOCAL CHECK	6000	2	7017	2	6509	2	124
	LSD AT 5%	1288		1348				
	% C.V.	17.65		17.5				
	NURSERY MEAN	5114		5384		5249		

% N.M. = % of nursery mean over locations
BLK= Balkh, TKR= Takhar, R= Rank.

Table 10. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT3) in two locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations						% of
		NGR	R	KDR	R	Mean	R	N.Mean
1	KAUZ	4075	10	4452	9	4264	13	96
2	KAUZ*2//SAP/MON/3/KAUZ	3862	14	5277	2	4570	5	103
3	ND/VG9144//KAL/3B/3/YACO/4/CHIL	4512	3	4860	6	4686	3	105
4	VORONA/CNO79//KAUZ	4312	6	3933	15	4123	15	93
5	SPINGHAR-94	3812	15	4732	8	4272	12	96
6	LOCAL CHECK	4112	8	5257	3	4685	4	105
7	BUGU	3987	12	5450	1	4719	2	106
8	AMSEL/TUI	4087	9	4760	7	4424	8	100
9	KAUZ//ALTAR 84/405	4387	4	4242	13	4315	11	97
10	KAUZ/3/SAPI/TEAL//HUI	4012	11	4259	12	4136	14	93
11	CHIL/2*STAR	3937	13	4942	5	4440	7	100
12	MYNA/VUL//TURACO/3/TURACO	4287	7	5220	4	4754	1	107
13	VEE#8//JUP/BJY/3/F3.71/TRM/4/BCN/5/KAUZ	4525	2	4308	11	4417	9	99
14	VEE#8//JUP/BJY/3/F3.71/TRM/4/BCN/5/KAUZ	4937	1	3958	14	4448	6	100
15	KAUZ//ALTAR 84/ADS/3/KAUZ	4337	5	4415	10	4376	10	99
	LSD AT 5%	756		1419				
	% C.V.	12.6		21.29				
	NURSERY MEAN	4212		4671		4442		

% N.M. = % of nursery mean over locations
NGR= Nangrahar, KDR= Kandahar, R= Rank.

Agroclimatic Zones of Afghanistan

The crop improvement project (UNO/AFG/001/DPS) started its activities in 1996 in 6 zones in the country. In order to be able to serve the whole country and obtain data that will enable us to identify genotype with wide adaptability. Through such practice, under the prevailing security and transportation conditions, the FAO crops program will be in a better position to respond to planting material needs of the country. Zonal map, cultivable land and a brief description of these zones is presented here.

1. **Northern Zone:** This zone includes the provinces of Balkh, Faryab, Jowzjan and Samangan. The elevation of this zone ranges from 260-2000 meters above sea level (masl). The total cultivable land area of this zones is 2,382,621 ha of this 674,615 ha is irrigated , 1,493,357 ha is rainfed and 214,649 ha barren. The research activities of this project are carried on farmer's field in Mazar-e-Sharif in Balkh province because the land and facilities of the agriculture research station have been divided among the war lords for housing. The mean maximum and mean minimum temperatures are 33.1^0 C and 1.1^0 C. This zone has a total of 253 frost free days. The first frost occurs on about 16 November and the mean date of last frost is March 7. The average total annual precipitation is 200 mm. The major crops are cereals, pulses, cotton, vegetables, melon, water melon and oil crops.
2. **North Eastern Zone:** This zone includes the provinces of Takhar, Badakhshan, Kunduz and Baghlan. The elevation of this zone ranges from 400-1800 (masl). The total cultivable land area of this zones is 1,170,017 ha of this 385,119 ha is irrigated 780,209 ha is rainfed and 4,689 ha barren. The land and facilities of the agriculture research station in Taloqan are not available for the activities of this project. The research activities are carried on farmer's field in Taloqan, center of Takhar province. The average annual precipitation is 642 mm. Mean maximum and mean minimum temperatures are 27o C and -2.3o C respectively. This zone has a total of 250 days frost free days. The mean date of first frost occurs on December 3 and mean date of last frost day is March 27. The major crops grown in this zone are: cereals, paddy, pulses, vegetables and fruits.
3. **Eastern Zone:** This zone includes the provinces of Nangrahar, Laghman, Kunar and Paktia. The elevation ranges from 430-2000 (masl). The total cultivable land area of this zones is 266,505 ha of this 248,364 ha is irrigated, 3,467 ha is rainfed and 14,674 ha barren. The crop improvement project is working in Nangrahar province on the agriculture research station in Jalalabad city. The average annual precipitation is about 172 mm. The climate is sub tropical, hot humid summers and mild winters. The mean maximum temperature is 40^0 C and the mean minimum temperature is 2^0 C. On average the first frost occurs in autumn on December 4, and the mean date last day of frost is on January 22 with a total of 315 frost free days. The major crops grown in this zone are cereals (wheat, maize, barley and rice), vegetables, citrus and sugarcane.
4. **East Central Zone:** This zone is consists of Kabul, Logar, Paktika, Parwan, Kapisa, Wardak, Bamyan and Ghazni provinces. The crop improvement project has its activities in Ghazni province because the facilities in Kabul could not be used for security reasons. The research findings are applicable to the whole zone. The elevation range of this zone is (1800-2900 masl). Annual maximum mean temperature is 24.6°C and the annual minimum mean temperature is -5.9° C. Average precipitation of this zone is 292 mm annually. The first frost usually occurs on 12

Table 11. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT4) in two locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations						% of
		NGR	R	KDR	R	Mean	RNK	N.M
1	VORONA/CNO79//KAUZ	3564	11	5305	1	4435	1	113
2	TJB368.251/BUC//CUPE	3639	10	3135	14	3387	14	86
3	TJB368.251/BUC//CUPE	3782	6	4627	4	4205	7	107
4	ARIANA-94	3744	9	4675	3	4210	6	107
5	KAUZ/GEN	4070	4	4482	5	4276	3	109
6	COOK/VEE//DOVE/SERI/3/GEN	3197	15	3373	13	3285	15	84
7	BOW/CROW//BUC/PVN/3/YR	3232	13	4390	6	3811	9	97
8	BOW/CROW//BUC/PVN/3/VEE#10	3767	7	3013	15	3390	13	86
9	KAUZ*2/OPATA//KAUZ	3452	12	3617	12	3535	12	90
10	KAUZ*2/PGO//KAUZ	3947	5	4777	2	4362	2	111
11	KAUZ*2/3/COOK/VEE/DOVE/SERI/4/KAUZ	3222	14	4378	7	3800	10	97
12	KAUZ*2/SPB//KAUZ	3753	8	3658	11	3706	11	95
13	KAUZ*2/YACO//KAUZ	4412	1	4113	9	4263	4	109
14	KAUZ*2/YACO//KAUZ	4211	2	4235	8	4223	5	108
15	KAUZ*2//SAP/MON/3/KAUZ	4108	3	3740	10	3924	8	100
	LSD AT 5%	862		1223				
	% C.V.	16.2		20.9				
	NURSERY MEAN	3740		4101		3921		

% N.M. = % of nursery mean over locations

NGR= Nangrahar, KDR= Kandahar, R= Rank.

Table 12. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT5) in two locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations						% of
		BLK	R	TKR	R	MEAN	RNK	N.M
1	FOW-1	6120	3	5650	13	5885	13	95
2	KAPSW	6501	1	6333	11	6417	5	103
3	FONG CHAN#3/TRT"s"//VEE#9/3/COOK/VEE"s"//DOVE"s"/SERI	5560	13	6983	5	6272	8	101
4	BOW"s"/IMU	5662	12	6542	9	6102	10	98
5	PREW	5481	14	6420	10	5951	12	96
6	TOWPE	5919	8	7253	2	6586	3	106
7	KASYON"s"/T.AEST	6412	2	6158	12	6285	7	101
8	ALD's'/HUAC's'/5/4777(2)//FKN/Gb/3/VEE's'/4/BUC's'/PVN's'	5310	15	6642	7	5976	11	96
9	W3918A/JUP/GRU90-201736	6067	7	5300	15	5684	14	91
10	SHI#4414/CROW's'//VEE's'/SNB's'	6110	4	7097	3	6604	2	106
11	NS732/HER//SHI#4414/CROW's'	5731	11	5617	14	5674	15	91
12	RSK/5/21931/3/CH53/AN//Gb56/4/AN64/6/TR380-16-3A614/CHAT's'	6106	5	7000	4	6553	4	105
13	TSI/VEE#5's'//KAUZ's'	5902	9	6903	6	6403	6	103
14	KAUZ's'/ABE	6098	6	7488	1	6793	1	109
15	LOCAL CHECK	5835	10	6600	8	6218	9	100
	LSD AT 5%	909		1263				
	% C.V.	10.76		13.6				
	NURSERY MEAN	5921		6532		6227		

% N.M. = % of nursery mean over locations

BLK= Balkh, TKR= Takhar, R= Rank.

Table 13. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT6) in two locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations						% N. Mean
		BLK	R	TKR	R	MEAN	R	
1	TSI/VEE#5's'//KAUZ's'	6364	3	6992	3	6678	3	109
2	C182.24/C168.3/3/CNO*2/7C/CC/TOB/4/Bb/7C*2//Y50E/KAL*5	5975	11	4750	14	5363	14	87
3	BOW's'/BUC's'//SUDAN #1	6095	9	6875	5	6485	7	105
4	VEE's'/MYNA's'/5/MAYANA74's'/ON//II60.147/3/Bb/G11/4/CHAT's'	5895	12	6780	7	6338	9	103
5	MAYA 74's'/ON//II60-147/3/Bb/G11/4/CHAT's'/5/BOW's'*2/PRL's'	5725	13	5342	13	5534	12	90
6	WA4767/391.56.D.81.14.33/3/1015//6410/4/W22/5/ANA/6/WGRU86 4331	6148	6	6317	10	6233	10	101
7	BOW's'*2/PRL's'//71ST2959/CROW's'	5295	14	5667	12	5481	13	89
8	CHAM 4/GH's'/BOW's'	6085	10	6917	4	6501	6	106
9	BYRSA/5/MAYA74's'/ON//II60.147/3/Bb/G11/4/CHAT's'	6125	7	6725	8	6425	8	104
10	VEE's'//H567.71/5*NAC/3/VEE's'/4/JUP/BJY's'//URES	6221	5	6808	6	6515	5	106
11	HD2206/HORK's'//KOEL's'/VEE's'	6105	8	5817	11	5961	11	97
12	4777(2)//FKN/Gb/3/VEE's'/4/BUC's'/PVN's'/5/VEE's'/TSI	6710	1	6667	9	6689	2	109
13	PSN's'/BOW's'//KAUZ's'	6398	2	7070	1	6734	1	109
14	Cc//Cal/Se/3/K3L/Bb/4/NS732/Her	4937	15	4542	15	4740	15	77
15	LOCAL CHECK	6245	4	7000	2	6623	4	108
	LSD AT 5%	1019		900				
	% C.V.	11.85		10				
	NURSERY MEAN	6023		6284		6153		

% N.M. = % of nursery mean over locations

BLK= Balkh, TKR= Takhar, R= Rank.

Table 14. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT7) in four locations under both rainfed and irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations												% of N.
		HRT1	R	HRT2	R	BLK	R	TKR	R	MEAN1	R	MEAN2	R	Mean2
1	HENNE/PGO	784	4	815	15	4265	7	1283	9	1787	10	961	14	92
2	FOW-2	725	6	1380	2	4612	1	1475	2	2048	1	1193	2	114
3	VAN's'/3/CNDR's'/ANA/CNDR's'/MUS's'	602	12	1169	7	4595	2	1188	13	1889	3	986	12	94
4	KAYSON's'/T.AEST	797	2	1428	1	3725	14	1417	3	1842	7	1214	1	116
5	SKH8/4/Rrv/Wwi5/3/Bj's'//On*2/Bon/5/Rbs/Anza/3/Kvz/	842	1	954	14	4026	10	1158	14	1745	13	985	13	94
6	4777(2)//Fkn/Gb/3/Vee's'/4/Buc's'/Pvn's'/5/Ald's'/3/Cc//	599	13	1149	8	4086	9	1133	15	1742	14	960	15	92
7	Cs/E.Gig//Cs/3/3*Pvn's'/3/K134(60)/Vee's'	687	8	1057	13	4490	3	1400	5	1909	2	1048	7	100
8	Sannine/Ald's'//Mn72131/PVN	700	7	1129	11	4231	8	1325	7	1846	6	1051	6	100
9	NS732/Her//Kauz's'	525	14	1181	6	4419	4	1308	8	1858	5	1005	9	96
10	Prl's'/Vee's'/3/P106.19//Soty/Jt*3	792	3	1234	3	3537	15	1250	11	1703	15	1092	4	104
11	Anza/3/PI/Nar//Hys/4/Vee's'/5/Vee's'	633	11	1201	5	3944	13	1275	10	1763	11	1036	8	99
12	Anza/3/PI/Nar//Hys/4/Vee's'/5/Vee's'	500	15	1071	12	4270	5	1400	4	1810	9	990	11	94
13	Psn's'/Bow's'//Kauz's'	735	5	1217	4	3949	12	1367	6	1817	8	1106	3	106
14	Shi#4414/Crow's'//Gomam	644	9	1145	10	3991	11	1217	12	1749	12	1002	10	96
15	LOCAL CHECK	637	10	1146	9	4269	6	1483	1	1884	4	1089	5	104
	LSD AT 5%	222		446		785		301						
	% C.V.	23.14		27.04		13.22		16						
	NURSERY MEAN	671		1152		4161		1312		1826		1048		

MEAN1 = is for 4 locations including Balkh where it received 2 irrigations.
MEAN2 = is for 3 locations without supplemental irrigations.
% N.M. = % of nursery mean over locations
HRT1= Dezwari of Herat, HRT2= Khowaja Malal of Herat, BLK= Balkh, TKR= Takhar, R= Rank.

Table 15. Summary of mean yield data (kg/ha) and rank of 10 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT8) in three locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations								% N. Mean
		KDR	R	BLK	R	TKR	R	MEAN	R	
1	71St2959/Crow's'/3/Ahqaf/Mxc/Tob	4682	2	5671	9	6350	7	5568	4	102
2	Bow's'/Seri 82	4247	4	5980	6	6633	5	5620	3	103
3	Bow #1/Fengkang 15	3230	9	6254	4	6800	2	5428	7	99
4	Snb's'//Aldan's'/Ias58	3323	8	6295	3	6792	3	5470	6	100
5	Bobwhite #1/Fengkang#15	3000	10	5924	7	7025	1	5316	8	97
6	Gv/Ald's'/5/4777#2//Fkn/Gb/3/Vee5/4/Buc's'/Pvn's'	3685	7	5757	8	5567	9	5003	10	91
7	Bobwhite #1//Mn72131/PVN	4270	3	6437	2	6458	6	5722	2	105
8	Gv/Ald's'/5/477#2//Fkn/Gb/3/Vee5/4/Buc's'/Pvn's'	5032	1	5336	10	5217	10	5195	9	95
9	Tsi/Vee's'//Bobwhite #1	4078	6	6841	1	6642	4	5854	1	107
10	Local check	4193	5	6242	5	6250	8	5562	5	102
	LSD at P= 5%	1655		1132		1195				
	% C.V.	28.7		12.82		12.9				
	NURSERY MEAN	3974		6074		6373		5474		

% N. Mean = % of Nursery mean over locations and replications
KDR= Kandahar, BLK= Balkh, TKR= Takhar, R= Rank.

Table 16. Summary of mean yield data (kg/ha) and rank of 10 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT9) in three locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations								% N.
		KDR	RNK	BLK	RNK	TKR	RNK	MEAN	RNK	Mean
1	MAYDOR	5097	4	5549	2	4250	8	4965	4	104
2	CHIRYA.1	2323	10	5107	5	5042	4	4157	8	87
3	CS/TH.CJ//SLEN/3/ALD/PVN/4/SUZB	4067	7	3549	10	4175	9	3930	10	82
4	CS/TH.CJ//SLEN/3/ALD/GEN/4/SUZB	2987	9	4752	7	5683	3	4474	7	93
5	GISUZ	4538	6	4532	8	4788	5	4619	6	96
6	DESC/SERI/FCT	5228	3	5491	3	5825	2	5515	2	115
7	CS/TH.CJ//SLEN/3/ALD/PVN/4/CS/LE.RA//2*...	5788	2	5236	4	4318	7	5114	3	107
8	CI14227/TR4/MAD/3/FAN1/4/NANJING B2147...	3145	8	4507	9	4642	6	4098	9	86
9	MAYDOR	5038	5	4909	6	4100	10	4682	5	98
10	Local check	6337	1	6424	1	6322	1	6361	1	133
	LSD at P= 5%	1139		910		892				
	% C.V.	17.4		12.53		12.5				
	Nusery mean	4515		5006		4914		4792		

% N. Mean = % of Nursery mean

KDR= Kandahar, BLK= Balkh, TKR= Takhar, R= Rank.

Table 17. Summary of mean yield data (kg/ha) and rank of 15 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT10) in four locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations										% N.
		NGR	R	BLK	R	HRT	R	TKR	R	MEAN	R	Mean
1	NL 623	4619	11	4337	7	5347	3	6017	4	5080	6	104
2	KAUZ*2/YACO//KAUZ	4581	12	5014	3	4519	9	6822	2	5234	4	108
3	BL 1135	5350	2	4748	4	4620	7	5778	7	5124	5	105
4	KAUZ*2/OPATA//KAUZ	4781	7	5434	1	5202	5	7128	1	5636	1	116
5	MS SONG	4456	13	3378	14	3907	14	5053	15	4199	15	86
6	KAUZ*2/MNV//KAUZ	4656	10	4609	5	6156	1	5575	10	5249	3	108
7	PRINIA	5182	3	3721	11	4071	11	5675	8	4662	9	96
8	SW89.3243	4897	5	3700	13	4064	12	5917	5	4645	10	95
9	SW89.1862	4944	4	4049	8	4051	13	5488	11	4633	11	95
10	BL 1496	4694	8	4555	6	5009	6	5647	9	4976	7	102
11	LOCAL CHECK	4675	9	3818	10	4546	8	5867	6	4727	8	97
12	BACANORA T 88	4125	14	5237	2	5244	4	6412	3	5255	2	108
13	RAJ1771	5563	1	3718	12	3692	15	5253	14	4557	13	94
14	PRLII/CM65531	3637	15	3898	9	5560	2	5342	13	4609	12	95
15	SW91-12331	4819	6	3214	15	4214	10	5450	12	4424	14	91
	LSD AT 5%	880		628		999		1174				
	% C.V.	13		10.4		14.9		14.3				
	Nursery Mean	4732		4229		4680		5762		4867		

% N. Mean= % of nursery mean

NGR= Nangrahar, BLK= Balkh, HRT= Herat, TKR= Takhar, R= Rank.

Table 18. Summary of mean yield data (kg/ha) and rank of 10 durum wheat lines tested in Preliminary Wheat Yield Trial (96PWDYT11) in four locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations										% N. Mean
		NGR	R	BLK	R	HRT	R	TKR	R	Mean	R	
1	SHAG-5	4356	4	5865	4	4302	10	5492	10	5004	10	94
2	PARVA-2	4346	6	5285	9	4980	9	5525	9	5034	8	94
3	ALTAR 84/SHL	4202	9	5870	3	6140	2	6417	2	5657	2	106
4	SPOT-2	3457	10	5616	5	6065	3	6233	3	5343	4	100
5	LOTUS-5	4321	8	6099	1	5291	8	5575	8	5322	6	99
6	TOPDY 6	4355	5	5956	2	5361	7	5642	7	5329	5	100
7	SRN-2//YAVAUS/HUI	4819	1	5559	7	6727	1	6767	1	5968	1	112
8	MINIMUS-5	4486	3	5390	8	5511	6	5805	6	5298	7	99
9	OCEAN-2	4337	7	3975	10	5784	5	5967	5	5016	9	94
10	LOCAL CHECK	4494	2	5596	6	6004	4	6083	4	5544	3	104
	LSD at P = 5%	1317		979		757		1116				
	% C.V.	21		12.22		9.3		12.9				
	Nursery Mean	4317		5521		5617		5950		5351		

% N. Mean= % of nursery mean

NGR= Nangrahar, BLK= Balkh, HRT= Herat, TKR= Takhar, R= Rank.

Table 19. Summary of mean yield data (kg/ha) and rank of 10 triticale lines tested in Triticale Yield Trial (96TYT11) in two locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Locations						% N.
		NGR	R	TKR	R	Mean	R	Mean
1	CT775.81/ARDI-1//ANDAS-1	4269	1	5546	8	4908	4	104
2	DAGRO/IBEX//VIVET*2	3996	2	5612	7	4804	5	101
3	ERONGA 83	3843	3	5641	6	4742	6	100
4	KISSA-7-1	3758	4	6519	1	5139	1	108
5	DAGRO/IBEX//VIVET*2	3702	5	6516	2	5109	2	108
6	FD-693/2*FAHAD-4	3629	6	5750	4	4690	7	99
7	274/320/BGL/3/MUSX/LYNX/4/RHINO 9	3579	7	4941	10	4260	10	90
8	BUF 4//JLO 97/CIVET/3/LAMB 1//REH/YOGUI-1	3576	8	6341	3	4959	3	105
9	LIRON-1	3453	9	5375	9	4414	8	93
10	LOCAL CHECK	3127	10	5644	5	4386	9	93
	LSD at P = 5%	894		1287				
	% C.V.	16.7		15.3				
	Nursery mean	3693		5788		4741		

NGR= Nangrahar, TKR= Takhar, R= Rank.

Table 20. Summary of mean yield data (kg/ha) and rank of 10 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT13) in four cooler locations under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Yield kg/ha, data of 1996-97 season										% N. Mean
		TKR	R	GZN	R	LGR	R	WRD	R	MEAN	R	
1	KS82142/SERI	5375	4	8980	1	6366	6	3500	5	6055	1	109
2	TIRCHMIR/LCO	3833	10	7566	7	6533	3	4031	3	5491	6	99
3	HATSUSHA/S	5683	3	7366	8	6633	2	1812	10	5374	8	97
4	ABN/JUN	4985	8	8446	2	6513	4	2875	8	5705	4	103
5	ATAY-85	5688	2	5640	10	4866	9	3062	7	4814	10	87
6	JAR/3//CNO/SARIC/4/JUP/4/ANZ/3/PI/...	5033	7	7666	5	5666	8	3250	6	5404	7	98
7	NKT//JUP/COQUENA	5042	6	6413	9	4546	10	4187	2	5047	9	91
8	MNCH	5822	1	7606	6	6433	5	3750	4	5903	3	107
9	AGRI/NAC (ES91-18)	4892	9	8226	4	6200	7	4312	1	5908	2	107
10	KS82214/GALVEZ 87	5183	5	8380	3	6680	1	2187	9	5608	5	101
	LSD at P= 5%	1046		934		1098		1081				
	% C.V.	13.9		8.4		12.5		22.6				
	Nursery Mean	5154		7629		6044		3297		5531		

% N. Mean = % of Nursery mean

TKR= Takhar, GZN= Ghazni, LGR= Logar, WRD= Wardak, R= Rank.

October and the last frost occurs on 6 April with a total of 189 frost free days. In Bamyan the first frost occurs on September 15 and the last day of frost is 15 May with a total of 135 frost free days. The total cultivable land is 596,035 ha of this 533,004 ha is irrigated, 18,324 ha is rainfed and 44,707 ha is barren. The major crops of the area are cereals, vegetables and fruits.

5. **Southern Zone:** It includes provinces of Kandahar, Oruzgan, Helmand, Zabul and Nimroz, with a total cultivable area of 5,756,664 ha of which 866,893 ha is irrigated, 133,832 ha is rainfed and 4,755,939 ha is barren. The elevation ranges from 900-1900 masl. The average annual precipitation is 180 mm. The mean date of first frost is November 20 and the last frost mean date is February 21 with a total of 271 frost free days. The mean maximum and mean minimum temperatures of this zone are 42° C and 4° C. The activities of this project are conducted on farmers field in Dand district of Kandahar province. The major crops are cereals, fruits, (grapes, pomegranates, apricot and almond) and vegetables.
6. **North Western Zone:** This zone is consisted of Herat, Ghor, Farah, and Badghis provinces. The total cultivable area of this zone is 1,365,487 ha of which 641,900 ha is irrigated, 650,996 ha is rainfed and 72,591 ha is barren. The elevation from the sea level is from 740-1360 masl. The average annual precipitation is 270 mm. The mean date of first frost is November 3 and mean date of last frost is March 28 with a total of 228 frost free days. The maximum mean temperature is 29°C and the minimum mean temperature is 0.6°C. The research trials are conducted on Urdo Khan agriculture research station in Herat province. The major crops are cereals, paddy, vegetables, cumin (*Cuminum cyminum)*, fruits and food legumes.

Table 21. Summary of mean yield data (kg/ha) and rank of 10 bread wheat lines tested in preliminary wheat yield trial (96PWYT14 b) in Nangrahar under irrigated conditons during 1996-97 crop season in Afghanistan by FAO.

No	Name or pedigree	Yield kg/ha	
		Yield	Rank
1	MON/IMU//ALD/PVN	5050	1
2	PICUS	4239	8
3	OPATA	4258	7
4	CHUM 21	4850	2
5	NANJNG 8611	3368	10
6	RL601016*YR//3*SERI	4304	6
7	KAUZ	4635	3
8	BR12*3/3/BR14//LD*6/FB6628	4130	9
9	CETTIA	4580	4
10	HD2285	4497	5
	LSD AT 5%	661	
	% C.V.	10.4	
	Site mean	4391	

Table 22. Summary of mean yield data (kg/ha) and rank of 10 bread wheat lines tested in Preliminary Wheat Yield Trial (96PWYT15b) in Nangrahar under irrigated conditons during 1996-97 crop season in Afghanistan.

No	Name or pedigree	Yield kg/ha	
		NGR	RNK
1	PRL/VEE#6//MYNA/VUL	4822	6
2	CHIL/PRL	5014	1
3	KEA/TOW//LIRA	3835	9
4	CBRD	4989	3
5	MNV/BUC	4858	5
6	PRL11/CM65531	3331	10
7	TJ8368.251/BUC//CUPE	4191	7
8	CHIL/BUC	4891	4
9	OPATA/KILL//PRL/VEE#6	4990	2
10	HD2285	3919	8
	LSD AT 5%	963	
	% C.V.	14.8	
	NURSERY MEAN	4484	

Table 23. The effect of different dates of planting and varieties on wheat mean yield kg/ha and rank in four provinces (Warm and mild winter) areas of Afghanistan during 1996-97

NO.	Date of Planting	Locations							
		Nangrahar	Rank	Kandahar	Rank	Balkh	Rank	Herat	Rank
1	01 NOV.	5525	1	5490	5	6193	3	6305	2
2	15 NOV.	5345	3	8771	1	6264	2	6390	1
3	31 NOV.	4735	4	6366	4	6722	1	6146	3
4	15 DEC.	5465	2	6768	3	5821	4	5793	4
5	30 DEC.	4112	5	7747	2	5258	5	5621	5
LSD at 5%		1012		861		875		918	
Variety		Kauz		Kauz		Kauz		Pamir-94	

Table 24. The effect of different dates of planting and varieties on wheat mean yield Kg/ha and rank in Ghazni and Takhar provinces in 1996-97.

No.	Date of Planting	Mean yield kg/ha			
		Ghazni	Rank	Takhar	Rank
1	01 Oct.	7500	1	6664	5
2	15 Oct.	6125	2	7068	1
3	30 Oct.	2750	4	7538	4
4	15 Nov.	2285	5	6884	3
5	30 Nov.	3185	3	6983	2
LSD at 5 %		1015		1332	
Variety		Pamir-94		Kauz	

Table 25. The effect of different rates of urea and phosphorus on mean yield in kg/ha wheat variety (Pamir-94), yield differences, and profit in Ghazni & Herat Provinces during1996-97.

No.	Fertilizer kg/ha N - P2O5	Locations and effects							
		HRT	Dif	E.G.	R	GZN	Dif	E.G.	R
1	N0P0 (0-0)	3253	0	0	9	8150	0	0	9
2	N0P1 (0-46)	5056	1803	12385450	5	8450	300	1639000	8
3	N0P2 (0-92	4303	1050	6495500	7	9100	950	5780500	4
4	N1P0 (57-0)	3863	610	3865600	8	8825	675	4330350	7
5	N1P1 (57-46)	7276	4023	27762550	3	9250	1100	6863100	3
6	N1P2 (57-92)	6343	3090	20585600	4	9075	925	5105850	5
7	N2P0 (115-0)	3988	735	4254750	6	8990	840	5005500	6
8	N2P1 (115-46)	8296	5043.	34550950	2	9300	1150	6716000	2
9	N2P2 (115-92)	8573	5320	36025500	1	9300	1150	6210000	1

LSD at 5% 1301 818
% C. V. 15.75 6.27
E.G. = Economic gain in AFS
Dif= Difference in yield from check due to treatment
R= Rank , HRT= Herat, GZN= Ghazni
Nitrogen= 8700 AFS/kg, P2O5= 11000 AFS/Kg, Wheat = 7150 AFS/Kg.

Table 26. The effect of different rates of urea and phosphate fertilizer on yield performance kg/ha of wheat variety Kauz, yield differences and profit in four locations during 1996-97 in Afghanistan.

No.	Fertilizer kg/ha	Locations and effects															
	N- P2O5	NGR	Dif.	E.G.	R	TKR	Dif.	E.G.	R	KDR	Dif.	E.G.	R	BLK	Dif.	E.G.	R
1	N0P0 (0-0)	3121	0	0	7	4192	0	0	8	1181	0	0	9	5492	0	0	7
2	N0P1 (0-46)	2788	-333	-2886950	9	4138	-54	-892100	9	1664	483	2947450	7	5513	21	-355850	6
3	N0P2 (0-92	2982	-139	-2005850	8	4250	58	-597300	7	1621	440	2134000	8	4951	-541	-4880150	9
4	N1P0 (57-0)	3313	192	876900	5	5625	1433	9750050	6	2280	1099	7361950	6	5693	201	941250	5
5	N1P1 (57-46)	4017	896	5404500	3	6344	2152	14384900	4	3501	2320	15586100	4	6490	998	6133800	2
6	N1P2 (57-92)	4038	917	5048650	2	6363	2171	14014750	3	3631	2450	16009600	3	6126	634	3025200	4
7	N2P0 (115-0)	4041	920	5577500	1	5663	1471	9517150	5	2812	1631	10661150	5	5413	-79	-1565350	8
8	N2P1 (115-46)	3523	402	1367800	4	7225	3033	20179450	1	3951	2770	18299000	2	6211	719	3634350	3
9	N2P2 (115-92)	3242	121	-1147350	6	7158	2966	19194400	2	4568	3387	22204550	1	6988	1496	8683900	1

	NGR	TKR	KDR	BLK
CV%	32.19	18.31	20.7	16
LSD at 5% Level	1621	1513	846	1868

Dif. = Difference in yield due to treatment
E.G. = Economic gain in AFS
Nitrogen= 8700 AFS/kg, P2O5= 11000 AFS/Kg, Wheat = 7150 AFS/Kg.
NGR= Nangrahar, TKR= Takhar, KDR= Kandahar, BLK= Balkh, R= Rank

Table 27. Over all mean yield of selected wheat lines (mt/ha), from different trials and locations by F.A.O. in Afghanistan during 1991-1997.

NO	Name or Pedigree	1991-92			1992-93			1993-94			1994-95			1995-96			1996-97			1991-97			% of P.S.85
		L	Mean	R	L	Mean	R	L	Mean	R	L	Mean	R	L	Mean	R	L	Mean	R	L	Mean	R	
1	Atay-85 (hys/7c)	4	4.7	5	4	6.1	2	4	4.5	9	5	5.5	8	5	5.74	1	6	5.12	13	28	5.28	9	109.54
2	Pamir-94(YMH/TOB//MCD/3/I	2	5.6	2	3	7.7	1	3	6.8	1	5	6.2	6	4	5.71	2	8	5.67	4	25	6.28	1	130.29
4	CA8055/6/PATO(R)/CAL/3/7C	1	5.5	3	4	5.1	5	2	6.1	4	5	5.3	10	4	5.5	5	6	5.43	8	22	5.49	8	113.9
5	Kauz (JUP/BJY//URES)	5	4.9	4	9	4.9	7	4	6.1	4	4	6.6	4	6	5.13	11	6	5.3	10	34	5.49	8	113.9
6	ID 800994.w/VEE = Gul-96				2	5.6	4	3	6.8	1	5	6.6	4	5	5.36	7	6	6.04	1	21	6.08	4	126.14
7	VEE#7/OPATA= Takhar-96				3	5.1	6	2	5.2	6	7	6.4	5	3	5.33	8	6	5.53	5	21	5.51	7	114.32
8	BLL/SERI (3FAWWON#64)							3	6.2	3	5	5.5	8	5	5.38	6	6	5.94	2	19	5.76	6	119.5
9	K2340/SX//MT/GB/3/K340/FR/4/PI"s"/KT54/NAR"s"										3	7.8	1	5	5.28	9	6	5.29	11	14	6.12	3	126.97
10	F134.71/CROW's'							2	3.8	11	3	6.7	3	5	5.21	10	6	5.39	9	16	5.28	9	109.54
11	AGRI/NAC (2FAWWON#45)	1	7.4	1	1	5.7	3	2	5.6	5	2	7.2	2	6	5.65	3	7	5.46	7	19	6.17	2	128.01
12	Bloundan/3/Bb/7C*2/Y50E/KAL*3 (1RBWYT-FA#15)							1	3.9	10	1	6.6	4	7	4.69	14	7	5.88	3	16	5.27	10	109.34
13	ANZA/KATAYA A1 (2FAWWON#168)							2	6.6	2	3	5.8	7	4	5.6	4	6	5.5	6	15	5.88	5	121.99
14	Pirsabak-85	5	4.3	6	9	4.4	8	4	4.8	8	8	5.4	9	8	4.76	13	6	5.23	12	40	4.82	11	100
15	PRL/(S)/PEW (Rainfed)				2	2.23	10	2	1.46	11				3	1.57		4	1.04	1	11	1.58	1	
16	HD2206/HORK//BUC/BUL (Rainfed)				2	2.06	11	2	1.53	10				3	1.62		4	0.71	2	11	1.48	2	

L = No. of locations   R= Rank

Table 28. Summary of yield data (Kg/ha) of 24 lines of regional bread wheat yield trial in favorable environment (RBWYT-FA) from ICARDA tested in seven locations in Afghanistan during 1996-97 crop season.

NO.	Name or Pedigree	Locations																% of Grand
		NGR	R	KDR	R	TKR	R	GZN	R	BLK	R	HRT	R	WRD	R	Mean	R	Mean
1	Maxipak 65 long term check	5522	20	4032	11	6367	16	1000	24	2906	24	4283	9	1417	24	3647	24	80
2	Bocro-3	6628	2	3697	14	7244	8	1817	20	4823	5	4900	2	3000	22	4587	13	100
3	Dovin-1	6574	3	3877	12	7672	3	2633	17	4542	13	4617	4	3833	9	4821	8	105
4	Bloyka	6372	5	5748	1	6168	20	4317	1	5760	2	4975	1	5333	1	5525	1	121
5	Doyin-2	6672	1	4545	6	7626	4	3183	10	4446	16	3591	24	4250	6	4902	5	107
6	Fow-1	6204	9	4561	5	6607	12	3300	9	4602	11	4136	13	3750	11	4737	9	103
7	Venac-1	6152	10	5324	2	6101	22	3917	3	4619	9	4391	7	4917	2	5060	3	111
8	Bow # 1/Fengkang 15	5722	19	3484	16	6141	21	2917	12	4152	17	4064	17	4000	7	4354	18	95
9	Maya74's'/On//Il60.147/3/Bb/	5759	18	3209	22	6251	18	2683	16	3671	22	3969	21	2916	23	4065	23	89
10	Dobuc-2	5981	12	3181	23	6922	10	1667	22	3735	21	4063	18	3417	15	4138	22	90
11	Bocro-4	5785	17	2704	24	7453	7	1317	23	4619	10	3971	20	3167	21	4145	21	91
12	Cham-4 (Improved check)	5954	13	4689	4	6851	11	3483	7	4783	6	4165	12	4317	5	4892	4	107
13	Kauz*2/Yaco//kauz	6315	7	3432	18	7593	5	2933	11	5635	3	4076	16	4000	8	4855	7	106
14	Towpe	5367	22	3311	20	6594	13	2917	13	4704	8	4123	14	3833	10	4407	16	96
15	Bow's'/Vee's'	6394	4	3356	19	6178	19	2917	14	3608	23	4035	19	3417	16	4272	19	93
16	Gv/Ald's'/5/Ald's/'4/Bb/G11//	5915	14	4751	3	5559	24	4000	2	3858	19	4261	11	3667	12	4573	14	100
17	Bobwhite #1/5/Jup's'/4/Lr64*2	6263	8	3476	17	6556	14	3750	5	5062	4	4344	8	3333	19	4683	10	102
18	Bocro-2	5372	21	3524	15	7839	2	2350	19	4467	15	3908	22	3583	13	4435	15	97
19	Gv/Ald's'/5/Ald's'/4/Bb/G11//	6141	11	4368	7	5787	23	3450	8	4581	12	4595	5	3417	17	4620	12	101
20	Seri 82//Vee's'/Snb's'	5787	16	3219	21	7856	1	2483	18	4777	7	3699	23	4750	3	4653	11	102
21	4777(2)/Fkn/Gb/3/Vee's'/4/Bu	5815	15	4045	10	6501	15	2883	15	3808	20	4119	15	3417	18	4370	17	95
22	Seri 82/Shi#4414/Crow's'	6357	6	4193	9	7487	6	3600	6	3958	18	4843	3	3500	14	4848	6	106
23	Cham-1 (improved durum chec	4833	24	4224	8	6306	17	1767	21	4498	14	4276	10	3333	20	4177	20	91
24	Nation check	5348	23	3827	13	7196	9	3867	4	6296	1	4463	6	4500	4	5071	2	111
	LSD 5%	1257		1861		1271		1247		961		1067		1861				
	C.V. %	12.8		28.7		11.4		26.3		12.6		15.3		30.5				
	Nursery Mean	5968		3949		6786		2881		4496		4244		3711		4577		

NGR= Nangrahar, KDR= Kandahar, TKR= Takhar, GZN= Ghazni, HRT= Herat, WRD= Wardak, BLK= Balkh, and R= Rank.

Table 29. Summary of yield data (Kg/ha) of 24 lines of regional bread wheat yield trial for semi-arid environment (RBWYT-SA) from ICARDA tested in eight locations in Afghanistan during 1996-97 crop season.

NO.	PEDIGREE	Locations																		% of N.C.M
		NGR	R	KDR	R	HRT1	R	HRT2	R	TKR	R	GZN	R	BLK	R	MEAN1	R	MEAN2	R	
1	Maxipak 65 long term check	3875	15	1268	22	551	22	915	1	1489	10	408	14	648	24	1308	22	880	23	89
2	Prew	4990	1	1413	16	749	14	613	20	1464	11	375	16	813	22	1488	7	905	21	92
3	Van's'/3/Cndr's'/Ana//Cndr's	4475	4	1333	19	704	17	626	17	1334	21	317	22	980	13	1396	15	882	22	90
4	Dovin-1	4683	3	1300	20	489	24	810	3	1576	4	642	1	1080	8	1511	5	983	13	100
5	Dovin-2	4212	8	1620	12	557	21	625	18	1354	17	483	8	1123	4	1425	13	960	17	97
6	Bocro-4	4117	9	1399	17	967	4	708	8	1511	7	358	18	835	20	1414	14	963	16	98
7	4777(2)/Fkn/Gb/3/Vee's'/4/B	4303	7	1825	10	888	8	735	7	1353	18	367	17	1100	7	1510	6	1045	8	106
8	Fow-2	4083	12	1031	24	585	20	754	6	1494	9	517	4	1063	9	1361	17	907	20	92
9	Florkwa-2	3997	13	2433	3	1126	2	818	2	1167	23	492	6	848	19	1554	4	1147	3	116
10	Towpe	3791	17	2035	7	1192	1	615	19	1650	1	333	21	1307	1	1560	2	1189	1	121
11	HD2169/6/Sdy/4/Fr/Kad/Gb/	2944	24	2016	8	767	12	699	12	1511	8	575	2	1247	2	1394	16	1136	5	115
12	Cham-6 (improved check)	4468	5	2189	6	928	5	781	4	1411	14	308	23	968	15	1579	1	1098	7	111
13	Florkwa-3	4694	2	1039	23	1074	3	700	11	1367	15	417	13	927	18	1460	11	921	19	93
14	Vee's'/5/Skh8/4/Rrv/Ww115/	3083	22	1351	18	917	7	576	22	1611	2	442	11	1108	6	1298	23	1001	11	102
15	Shi#4414/Crow's'	3847	16	1289	21	667	18	644	16	1517	6	467	10	992	11	1346	19	929	18	94
16	Gv/Ald's'/5/Ald's'/4/Bb/G11/	4103	10	1424	15	526	23	594	21	1342	19	333	19	978	14	1329	21	866	24	88
17	Bobwhite #1//Mn72131/PVN	4368	6	1431	14	869	9	689	14	1583	3	392	15	932	17	1466	9	983	14	100
18	Bobwhite #1//Mn72131/PVN	3994	14	2511	2	749	15	776	5	1341	20	483	7	1030	10	1555	3	1148	2	117
19	Snb's'/5/Maya74's'/On//Il60.	4097	11	1723	11	919	6	707	9	1357	16	333	20	1210	3	1478	8	1042	9	106
20	Mon's'/Ald's'//Aldan's'/Ias58	3653	18	1876	9	768	11	469	24	1333	22	283	24	1122	5	1358	18	975	15	99
21	Seri 82//Shi#4414/Crow's'	3431	21	2380	4	746	16	703	10	1533	5	483	9	987	12	1466	10	1139	4	116
22	Shi#4414/Crow's'//Seri 82	3611	19	2599	1	765	13	693	13	1161	24	542	3	835	21	1458	12	1099	6	112
23	Cham-5 (improved durum che	2994	23	2229	5	664	19	522	23	1456	12	417	12	727	23	1287	24	1003	10	102
24	Nation check	3444	20	1613	13	799	10	647	15	1411	13	508	5	933	16	1336	20	985	12	100
	LSD at P= 5%	1357		1003		313		287		343		148		245						
	C.V. %	20.8		35.4		24.1		26.1		14.6		21		15						
	Nursery mean	3969		1722		790		668		1430		428		991						

MEAN1= All Locations, Mean2= Without NGR which was irrigated onece.

NGR= Nangrahar, KDR= Kandahar, TKR= Takhar, GZN= Ghazni, HRT1= Dezwari of Herat, HRT2= Khowaja Malal of Herat BLK= Balkh, and R= Rank.

Table 30. Analysis of variances of fertilizer rates on wheat in different provinces of Afghanistan during 1997 and 1998.

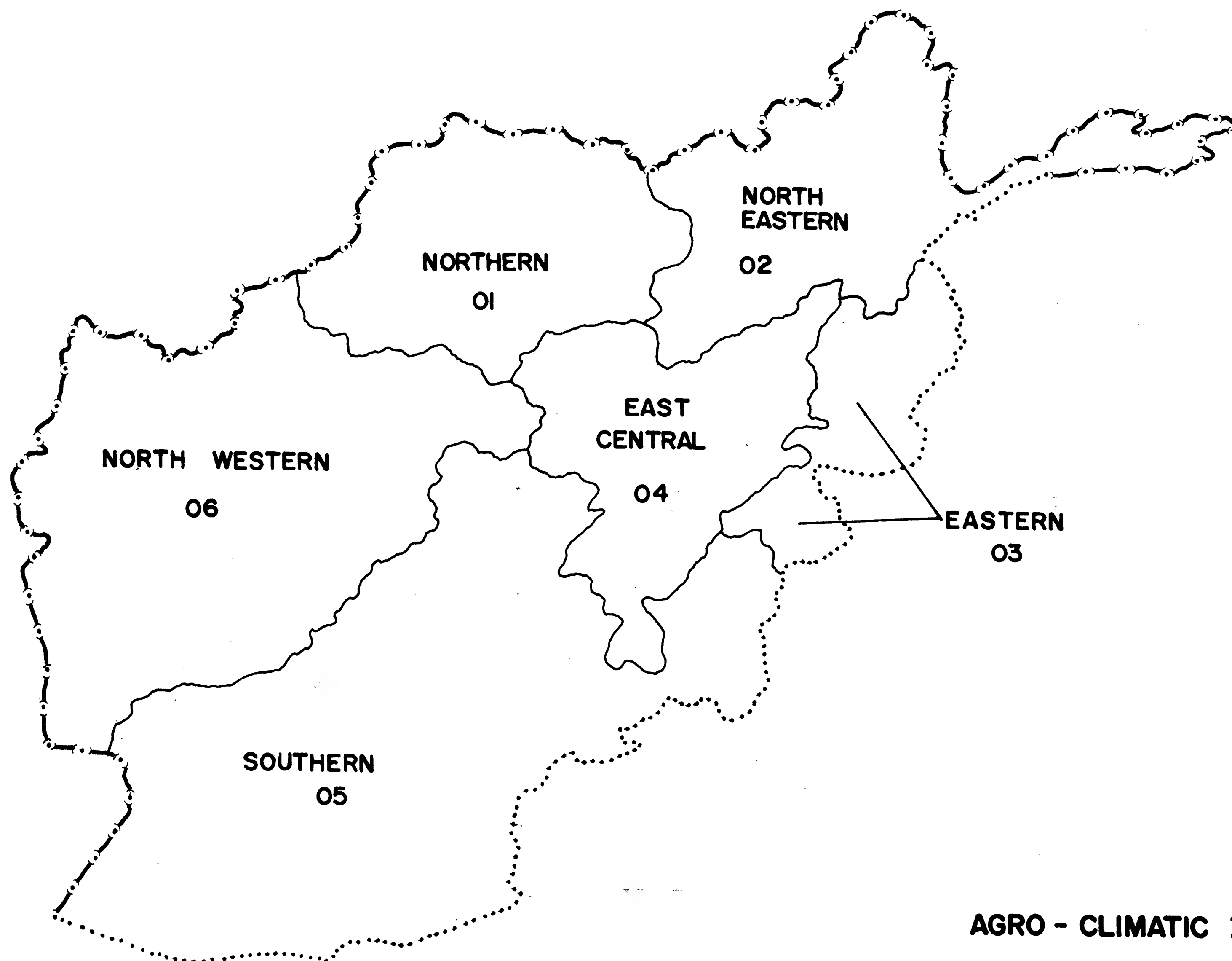
Sources of Variation	Degree of freedom	Mean square														
		NGR		BLK		KDR		TKR	HRT		GZN		LGM	KNR	NRT
		1997	1998	1997	1998	1997	1998	1997	1997	1998	1997	1998	1998	1998	1998
Replication	3	n.s	**	n.s	n.s	n.s	n.s	**	n.s	**	*	n.s	n.s	**	n.s
Nitrogen	2	n.s	**	n.s	**	**	**	**	**	**	*	*	**	**	**
Phosphorus	2	n.s	n.s	n.s	**	**	**	n.s	**	**	n.s	n.s	**	**	**
NxP	4	n.s	n.s	n.s	n.s	n.s	n.s	n.s	**	n.s	n.s	n.s	*	*	n.s
Error	24														

n.s = Nonsignificant

* = significant at 5 % level of probability

**= Highly significant at 1 % level of probability

NGR= Nangrahar, BLK = Balkh, KDR= Kandahar, TKR= Takhar, HRT = Herat, LGM= Langhman, KNR= Kunar, NRT = Nooristan, GZN = Ghazni,



AGRO - CLIMATIC ZONES OF AFGHANISTAN

BARLEY (*Hordeum vulgare L.)*

Introduction

Barley is the main cereal crop, after wheat and corn in Afghanistan the land under barley cultivation like other cereal crops is decreasing. It was 310,000 hectares in 1978-79. This area has decreased to 256000 hectares in 1989-90. The yield of barley is about one Mt./ha.

Two, four and six rows barley is grown in Afghanistan. Two rows barley is grown more under dry land farming in both fall and spring. Barley sown in fall usually gives 20% more yield than spring sown barley. It is used generally as animal feed. In Bamyan province naked barley is used for human consumption. The local varieties of barley are susceptible to diseases and lodges heavily. Before the war, the agricultural research institute of Afghanistan introduced 2 varieties of barley by the name of As-Trax-54 and Beecher through its barley variety trials program. Improved agronomic practices were also extended to farmers in Afghanistan. But unfortunately these two varieties also became susceptible to diseases and their yields have declined.

From 1990-1995, a number of variety trials on barley were conducted by SCA (Swedish Committee for Afghanistan). The FAO-crops project (UNO/AFG/001/DPS) has also conducted barley variety screening trials in 1996-97. Promising lines and varieties had been selected for inclusion in trials for further testing and the production of pre-basic and basic seeds.

Materials and Methods

International Winter and Facultative Barley Yield Trial, International Spring Barley Yield Trial, International Barley Observation Nursery and yield trial were sent from ICARDA and CIMMYT to SCA, Peshawar. These trials were dispatched to the provinces of Nangrahar, Takhar, Baghlan and Balkh for testing them under moderate rainfall areas and irrigated condition.

The designs of the experiments were RCBD with 3 replications. The plot size was 6 rows, 30 cm spacing between rows. The length of row was 2.5 m and 4 central rows were harvested. Half meter at each end was cut to reduce the border effect. Fertilizer was used at 60 kg Nitrogen and 40 kg P_2O_5 /ha. During the growing period all the necessary data, agronomic and diseases notes have been taken. The yield was recorded in gram per plot and changed to kg/ha. Upon the completion of the data, one copy has been sent to ICARDA and CIMMYT. Also in 1996-97 national barley yield trials were conducted by FAO in Nangrahar, Kandahar, Balkh, Herat, Ghazni and Takhar provinces in a randomized complete block design. There were 6 rows in each plot, row length was 5 meter and the distance between rows was 25 cm with a seed rate of 100 kg/ha.

Also in 1996-97 the international spring naked barley observation nursery which consisted of 50 varieties was tested in Herat province. This was sent from ICARDA and was planted in 2 rows one meter long and the distance between row was 25 cm. It was planted on 19/11/96 and harvested on 28/5/97. During the growing period it was given 6 irrigations.

Results and Discussions

Table 1 (Annex 3) shows that in Baghlan province under low rainfall (mild) conditions the variety Rihane-03 has given the yield of 3078 kg/ha and ranked first. While the Beecher, a long term check has yielded 1261 kg/ha and local variety yielded 1522 kg/ha. In comparison to Beecher and local, the variety Rihane-03 produced 144% and 102% more yield. Table 2 (Annex

3) indicates that the variety Rihane-03 has produced the highest yield in Khost and Takhar provinces and ranked first in both locations. When the result of Nangrahar was combined with it, the overall mean shows the yield of 3445 kg/ha and ranked 6th among 15 barley varieties while the local variety has given 2725 kg/ha. In comparison to local variety, it is still produced 26% more yield.

Table 3 (Annex 3) shows that under irrigation the highest yield of 5222 kg/ha was produced by the genotype (Rihane-03/3/Deir Alla 106//Mzq/DL71). The variety Assala-04 (Improved 6 row check) has given the yield of 4971 kg/ha. The line (Rihane/Badia) has produced the yield of 4640 kg/ha. The line (Api/CM67//DL71/3/Row 906-73/4/330) has given the yield of 4519 kg/ha. while the variety Beecher has yielded 4402 kg/ha. Their ranking is 1, 2, 3, 4 and 5 respectively. Compared to Beecher, they have produced 19%, 13%, 5% and 3% more yield. In comparison to local barley with the mean yield of 3549 kg/ha they have produced 47%, 40%, 31%, and 27% more yield respectively.

The trial was repeated under rainfed condition in Baghlan and Takhar provinces of Afghanistan (Table 3, Annex 3). The highest yield of 605 kg/ha was produced by the lines (Vg / Julia // Zy /3/ 6982 // DS / Apro // -SV.02 / 109 / Mari). The line Harmal-02/Salmas has yielded 556 kg/ha. The line ER/APM (improved 2-R Check) has produced 494 kg/ha. They ranked 1, 2 and 3 respectively. While the local check yielded 457 kg/ha and ranked 4th. These lines have yielded 33%, 22% and 8% more than the local check

The data in table 4 (Annex 3) shows that the variety Rihane-03 in Balkh and Takhar provinces under irrigated conditions, has given the highest mean yield of 6692 kg/ha. The variety Sonata has yielded 6540 kg/ha and the line (YEA 389.3/YEA475.4) has yielded 6431 kg/ha. The yield of local check was 4517 kg/ha. These lines have yielded 48%, 45%, and 42% more than the local check variety.

Under rainfed conditions the variety Sonata has given the highest yield of 2083 kg/ha. The line (YEA 389.3/YEA 475.4) has yielded 1891 kg/ha and the line (CWB 117-77-9-7 // Roho / Masurka) has yielded 1829 kg/ha and ranked 1, 2 and 3 respectively, while the local variety has given a yield of 1227 kg/ha. These lines have produced 70%, 54% and 49% more yield than the local variety respectively. When the data of both irrigated and rainfed conditions was combined the variety Sonata (5054 kg/ha), the line YEA 389.3 / YEA / 475.4. (4918 kg/ha) and the variety Rihane 03 (4802 kg/ha) ranked 1, 2 and 3 respectively.

Table 5 (Annex 3) shows the mean yield of 25 Barley varieties tested in Baghlan province of Afghanistan. It reveals that the highest yield of 8991 kg/ha was given by the line (GLORIA-BAR / COME-B // ORGE FICHEDRETT 3270) under irrigated conditions which is exceptionally high yield. The line TROMPILLO-BAR with the yield of 8898 kg/ha ranked second. The line (LIBRAN / UNA80 // LIGNEE640 /3/ GLORIA-BAR / COME-B) with yield of 8796 kg/ha ranked 3rd. The line (Libran / UNA8271 // Gloria-Bar / COME-B /3/ SEN) with a yield of (8518 kg/ha) ranked 4. The local variety has given the yield of 6796 kg/ha. Compared to local variety, these lines have produced 32%, 31%, 29 % and 25% more yield. Also in 1994-95 in the 4th International Winter and Facultative Barley Yield Trial carried out by AFGHAN AID a British NGO working in Takhar provinces, the variety RIHANE-03 has produced 33% more yield than improved check (Beecher).

In 1996-97, ten high yielding barley varieties were selected from previous trials and tested in a national barley yield trial in Nangrahar, Kandahar, Balkh, Herat, Ghazni and Takhar provinces. The results are summarized in table 6 (Annex 3). In Nangrahar province there are no significant differences between variety 1,2,4,5 and 8 but the variety 8 (Rihane-03) has produced the highest

yield of 2737 kg/ha and ranked first. The variety Trompillo-Bar has given the yield of 2583 kg/ha ranked second. Entry 4, (Libran /UNA8271...) has produced the yield of 2419 kg/ha and ranked 3rd, while the local check has given the yield of 1995 kg/ha. Compared to local check these varieties have produced 37%, 29% and 21% more yield.

Also in Kandahar it seems that there are no significant differences between the yields of variety 1, 2, 4, 5 and 8. However entry 8 (Rihane-03) with the mean yield of 5840 kg/ha, entry 2, (Trompillo-Bar) with the mean yield of 5510 kg/ha and the entry 4 (Libran UN A8271 // Gloria - Bar / Come-B /3/ SEN) with the mean yield of 5162 kg/ha have ranked 1, 2 and 3 respectively. Compared to local check (4257 kg/ha) they have produced 37 % 29% and 21% more yields (Table 6 Annex 3).

In Balkh province there are no significant differences between the mean yields of variety 1, 2, 4, 6, 8 and 9. The mean yields of these entries were significantly higher than the mean yields of entries 3, 5, 7, and 10. However entry 4 (Libran UNA871...) has produced a mean yield of 4933 kg/ha, the variety 8 (Rihane-03) has yielded 4842 kg/ha and line (Gloria-Bar / Copal / PM5 / BEN /3/ SEN) has produced a mean yield of 4583 kg/ha. They ranked 1,2 and 3 respectively, while the local check has yielded 4019 kg/ha. Compared to local check the above mentioned varieties have produced 23% 20% and 14% higher yields (Table 6 Annex 3).

Similarly there are no significant differences between the mean yields of entries 1,3,4, and 8 in Herat province, but entry 4 (Libran / UNA8271 // GLORIA-BAR / COME-B /3/ SEN) has produced a mean yield of 5929 kg/ha, entry 8 (Rihane-O3) has given a mean yield of 5891 kg/ha and the entry 1 (Gloria-Bar/ COME ...) has yielded 5478 kg/ha. The local check has given a mean yield of 4753 kg/ha. In comparison to the local check, these lines have produced 25%, 24% and 15% more yields (Table 6 Annex 3).

In Takhar province (Table 6 Annex 3) there are no significant differences between the mean yields of entries 1, 2, 3, 4, 5, 6, 7, 9 and 10. Entry 9 (YEA 389.3 / YEA475.4) has given a mean yield of 6828 kg/ha and ranked 1st. Entry 2 (TROMPILLO-BAR) ranked 2nd, and entry 4 (Libran/UNA 8271...) with a mean yield of 6478 kg/ha ranked 3rd. The local check has given a mean yield of 5844 kg/ha. In comparison to the local check these lines have produced 17%, 12% and 11% more yield. In Ghazni province (Table 6 Annex 3) the highest yield of 6692 kg/ha was produced by entry 1. Entry 3 yielded 6642 kg/ha. These yields are 3% and 2.5% more than local check.

The overall mean yields (kg/ha) and rank of 10 barley lines tested in National Barley Yield Trial in six locations of Afghanistan are summarized in (Table 6 Annex 3). It shows that entry 8 (RIHANE-03) with a mean yield of 5164 kg/ha, entry 4 (LIBRAN/UNA8271 // GLORIA-BAR / COME-B/3/SEN) with a mean yield of 5148 kg/ha, entry 2, (TROMPILLO-BAR) with a mean yield of 5030 kg/ha, entry 1 (GLORIA-BAR / COME-B // ORGE FICHEDRET3270...) with a mean yield of 5015 kg/ha, and entry 3 (LIBIRAN / UNA80 // LIGNEE640 /3/ GLORIA-BAR...) with a mean yield of 4783 kg/ha have ranked 1, 2, 3, 4, and 5 respectively. In comparison to the local check these lines have produced 13%, 12%, 11%, 10%, and 5% more yield.

The International Spring Naked Barley observation nursery was conducted in several locations. Lines 3, 6, 7, 10, 12, 14, 20, 26, 28, 29, 35, 36, and 48 are selected for further test during 1998.

Recommendations

The line (Rihane-03 /3/ Deir Alla 106 // MZQ/DL) was the top yielding line in 8 locations from 1993-1996. According to 1993-94 annual report of ICARDA for the International Barley Yield

Trials, Rihane-03 in 19 locations in 10 countries ranked in the top five or less for grain yield at each location in each major geographical areas and is the 10th highest yielding entry which proves its good performance and wide adaptability in the region.

The result of the National Barley Yield Trial in 6 locations in Afghanistan in 1996-97 showed that the variety (RIHANE-O3), the lines (LIBRAN / UNA8271 // Gloria-BAR / COME-B /3/ SEN), (TROMPILLO-BAR), (GLORIA-BAR / COME-B // ORGE FICHEDRET3270...) and (LIBRAN / UNA80 // LIGNEE640 /3/ GLORIA-BAR...), are top yielding lines and adapted well in 6 zones. Recommendation for release will be based on the results of 1997-98 crop season.

Annex 3
Barley data 1995-1997
(Tables 1-6)

Table 1. Mean yield (kg/ha) and rank of 24 barley lines of Barley Yield Trial for Low Rainfall areas from ICARDA tested in Baghlan province under rainfed conditions during 1993-94.

No.	Name of Pedigree	Baghlan	Rank
1	Rihane-03(Improved Check)	3078	1
2	Aths/Lognee 686	2017	9
3	Mari/Aths*2//Attiki	2850	2
4	Quinn/IFB974	78	24
5	N-ACC 4000-301-80/IFB974	2372	4
6	HARMAL(iMPROVED 2 R CHECK)	1906	11
7	ARAR//DEIR ALLA 106/CEL	122	23
8	ER/APM/AC253	1894	12
9	Harmel "s"/Kantara	1722	16
10	Lignee 1242/Hormal -02	1828	14
11	Deir Alla 106/Strain 205	2094	8
12	Beecher Long Term Check	1261	20
13	Mari/Aths*2//Attiki	2228	6
14	Arar/PI 386540	383	22
15	Arar/PI 386540	2278	5
16	Baca"s"/3/AC253//CI...	1933	10
17	Emir/Arabi Abiad//Roho	1761	15
18	Moroc 9-75(Improved 2 R Check)	1456	19
19	WI 2291/Bgs//Harmal -02	2661	3
20	WI 2291/Bgs//Harmal-02	1861	13
21	Arar/4/Lth/3/Nopal //Pro/11012	1206	21
22	Arizona 5908/Aths//Asse/3/F208-74	1500	18
23	Aths/Lignee 686	2122	7
24	National Check	1522	17

Table 2. Mean yield (kg/ha) and rank of 15 barley lines tested in Khost and Takhar under rainfed conditions and in Nangrahar under irrigated conditions during 1994-95.

No.	Name of Pedigree	Khost		Nagrahar		Takhar		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	Rihane/Lignee 640	1541	5	7546	6	1080	12	3389	7
2	Kitchin/mullers Heydla//salmas	1200	12	5800	12	1283	7	2761	12
3	DCTO-MS/WA 1094-67.....	1175	13	7180	7	1270	8	3208	8
4	YEA 389.3/YEA 475.4	1400	10	8100	4	1133	10	3544	5
5	Quina CMB 86A-1156-A.....	1750	1	8240	3	1373	5	3788	2
6	CLN"s" /80.5/38//Gloria "s"	1517	7	9253	1	764	13	3845	1
7	WI2197/CIV 3540//Arar	1480	8	3420	15	1137	9	2012	15
8	Rihane-05//As 46/Aths *2	1708	2	8053	5	1480	3	3747	3
9	Robur/HOR 728//F3 Bulk HIP	1675	3	6480	9	1131	11	3095	10
10	Rihane-03/3/Deir Alla 106//MZQ	1750	1	6920	8	1665	1	3445	6
11	Arizona 5908/Aths//Lignee 640	1652	4	6347	10	1380	4	3126	9
12	Lignee 527/Nk 1272	1533	6	6153	11	1363	6	3016	11
13	AS68	1425	9	4580	12	293	15	2099	14
14	PIRATE	1308	11	8753	2	690	14	3584	4
15	Local	975	14	5573	13	1628	2	2725	13

Table 3. Mean Yield (kg/ha) and rank of 24 barley varieties tested in International Spring Barley Yield Trial under irrigated and rainfed conditions in 4 locations in Afghanistan during 1995-1996.

No	Name or Pedigree	Locations				Mean 1		Mean 2	
		Nangrahar	Balkh	Baghlan	Takhar	Yield	Rank	Yield	Rank
1	Assala-04(Improved 6-R Check)	3827	6114	283	293	288	13	4971	2
2	Apm/HC1905//Robur/3/Arar	2627	5943	93	172	133	23	4285	8
3	W12197/CI 13540//Arar	2067	4136	262	98	180	22	3102	21
4	Bigs/Badia//Lignee 1242	3040	5587	133	131	132	24	4314	7
5	Rihane/Badia	2987	6293	158	412	285	14	4640	3
6	ER/Apm (Improved 2-R check)	2213	4694	675	312	494	3	3454	19
7	Quinn/Rihane//Quinn/Lignee 640	2707	5436	427	151	289	12	4072	12
8	Rihane-03/3/Deir Alla 106//Mzq/DL71	3427	7016	142	479	311	10	5222	1
9	Harmal-01//Pitayo/Cam	2597	3312	368	162	265	17	2955	23
10	Harmal-02/Salmas	3040	4421	798	313	556	2	3731	14
11	As46/Rihane-05	2953	5778	202	343	273	15	4366	6
12	Beecher (long term check)	3127	5677	192	213	203	20	4402	5
13	Cen/Bglo"s"	2473	4731	247	233	240	18	3602	16
14	W12291//Apm/PI 000046/3/Cr.115/Por//	2080	3322	435	243	339	8	2701	24
15	7028/2759/3/69-82//DS/Apro/5/W12291/	2693	3263	263	178	221	19	2978	22
16	Dier Alla 106//Api/EB8B-8-2-15-4/4/Lth	2927	5176	307	228	268	16	4052	13
17	Vg/Julia//Zy/3/69-82//Ds/Apro//Sv.0210	2413	5847	1187	23	605	1	4130	10
18	W12291 (improved 2-R check)	2887	5372	393	340	367	7	4130	11
19	M64-76/Bon//Jo/York/3/M5/Galt//As46/4	2680	3587	677	94	386	6	3134	20
20	Api/CM67//DL71/3/Row 906-73/4/3309/	2607	6431	198	171	185	21	4519	4
21	80-5151/3/Robur/CI 11577//F3 Bulk hip	2873	5511	500	178	339	9	4192	9
22	80-5145//ROD586/Nopal"s"	2513	4750	492	113	303	11	3632	15
23	Atem/W12291//Harmal	2153	4863	542	284	413	5	3508	18
24	National Check	1627	5471	492	422	457	4	3549	17

Mean 1 = Rainfed in Takhar and Baghlan.

Mean 2 = Irrigated in Nangrahar and Balkh.

Table 4. Mean yield (kg/ha) and rank of 24 barley varieties of (5IWFBYT) tested in Balkh and Takhar under irrigation and Baghlan under rainfed conditions.

No	Name or pedigree	Balkh		Takhar		Baghlan		Irrigated	
		Yield	Rank	Yield	Rank	Yield	Rank	Mean	Rank
1	Tokak`(check)	3959	21	3922	23	1252	18	3940.5	23
2	Roho/Mazurka//ICB-103020	5169	15	5233	11	1391	16	5201	14
3	YEA389.3/YEA475.4	6018	5	6844	1	1891	2	6431	3
4	Roho/Masurka//ICB103020	5407	10	5089	15	1602	10	5248	11
5	Rihane/Lignee 640//ICB-1077	5338	12	4444	20	1183	21	4891	18
6	YK Omega	5509	9	6650	2	1671	6	6079.5	5
7	Wysor	6441	3	5778	9	1229	19	6109.5	4
8	Rihane 03 (check)	7484	1	5900	7	1021	24	6692	1
9	skorohod	5313	13	6344	5	1528	13	5828.5	7
10	WKN 5185/82	5143	16	5233	12	1458	14	5188	15
11	Robur/WA2196-68	5913	7	4122	21	1669	7	5017.5	17
12	CWB117-77-9-7//ICB-10407	5350	11	4111	22	1403	15	4730.5	20
13	Sonata	6557	2	6522	3	2083	1	6539.5	2
14	K-201/3-2	6096	4	5900	8	1299	17	5998	6
15	Roho/Masurka//ICB-103020	4933	19	5500	10	1623	9	5216.5	12
16	Yesevi-93 check	3576	24	3772	24	1149	22	3674	24
17	Kitchin/Mullers Heydla/Salm	5789	8	4822	16	1530	12	5305.5	10
18	CWB117-77-9-7//Roho/Masu	5056	18	6506	4	1829	3	5781	8
19	CWB117-77-9-7/3/Roho//Alg	5923	6	4500	19	1625	8	5211.5	13
20	CWB117-77-9-7/3/Roho//Alg	3591	23	4561	18	1574	11	4076	22
21	Coss/CWB 71080-44-1H	4820	20	4811	17	1674	5	4815.5	19
22	Roho/Masurka//ICB-103020	5106	17	5150	13	1118	23	5128	16
23	CWB117-77-9-7//Roho/Masu	5292	14	5933	6	1815	4	5612.5	9
24	National check	3934	22	5100	14	1227	20	4517	21

Table 5. Mean Yield (Kg/ha) and rank of 25 Varieties of barley tested in International Barley Yield Trial by FAO during 1995-1996 in Afghanistan.

No.	Name	Yield	Rank
1	WATANI CHECK	6796	18
2	Gloria-BAR/COPAL//PM5/BEN/3/SEN	7963	6
3	ARUPO	7555	10
4	TROMPILLO-BAR	8898	2
5	ASSE/3CM//RO-B/3/SNA1/4/RUDA/5/AGAVE	6065	24
6	LBIRAN/UNA80//LIGNEE640/3/MJA	6120	23
7	GLORIA-BAR/SAIDA//MATNAN/EH165/3/LBIRAN/UNA80//LI(	6213	22
8	MATICO/97240762/3/LBIRAN/UNA80//LIGNEE640	6731	19
9	RHODES//TB-B/CHZO/3/GLORIA-BAR/COPAL/4/ESC.II.72.83.3	6500	20
10	CERISE/LAUREL//ALELI	7889	7
11	CAMPILLO LLERENA/DAPHNE//SEN	8444	5
12	MATICO/SEN//GLORIA-BAR/COPAL	6972	16
13	LIBRAN/UNA80//LOGNEE640/3/GLORIA-BAR/COME-B	8796	3
14	GLORIA-BAR/COME-B//ORGE FICHEDRETT3270	8991	1
15	GLORIA-BAR/COPAL//SEN	7694	8
16	CEN-B/3/LBIRAN/UNA8271//GLORIA-BAR/COME-B/4/SEN	6833	17
17	LBIRAN/UNA8271//GLORIA-BAR/COME-B/3/SEN	8518	4
18	CI10622/CI5824//PAICO/3/GLORIA-BAR/COPAL	7130	14
19	COLLO/SICH415.80//GLORIA-BAR/COME-B/3/LBIRAN/UNA8(	7389	12
20	AGAVE/SUMBARD400//MARCO	7194	13
21	DC-B/SEN	7509	11
22	EMIR/3/API/CM67-B//BUS/4/SHYRI/5/SEN	7685	9
23	ALPHA-BAR/DURRA//CORACLE/3/ALELI	7037	15
24	MARIS CANON/LAUREL//ALELI	5843	25
25	LBIRAN/UNA80//LIGNEE640/3/AMAPA/COTA//GLORIA-BAR/(	6296	21

Table 1. Zones, cultivable irrigated and rainfed land in hectares in Afghanistan

Zones	No	Name	Cultivable Land area in ha			% of total	
			Irrigate	Rainfed	Total	irrigated	Rainfed
Northern	1	Balkh	19391	340912	360303	5.38	94.62
	2	Faryab	147614	571600	719214	20.52	79.48
	3	Jawzjan	285928	295863	581791	49.15	50.85
	4	Samangan	47159	284982	332141	14.20	85.80
1		**Total**	**500092**	**1493357**	**1993449**	**25.09**	**74.91**
North Eastern	5	Badakhshan	43293	84709	128002	33.82	66.18
	6	Baghlan	108930	188356	297286	36.64	63.36
	7	Kunduz	152030	104400	256430	59.29	40.71
	8	Takhar	80866	402744	483610	16.72	83.28
2		**Total**	**385119**	**780209**	**1165328**	**33.05**	**66.95**
Eastern	9	Nangrahar	100010	0	100010	100.00	0.00
	10	Kunar	20277	3467	23744	85.40	14.60
	11	Laghman	26838	0	26838	100.00	0.00
	12	Paktia	101240	0	101240	100.00	0.00
3		**Total**	**248365**	**3467**	**251832**	**98.62**	**1.38**
East Central	13	Ghazni	210098	11117	221215	94.97	5.03
	14	Logar	37106	2666	39772	93.30	6.70
	15	Wardak	79385	1128	80513	98.60	1.40
	16	Bamyan	58937	2009	60946	96.70	3.30
	17	Kapisa	40647	1061	41708	97.46	2.54
	18	Kabul	57115	304	57419	99.47	0.53
	19	Parwan	49715	38	49753	99.92	0.08
4		**Total**	**533003**	**18323**	**551326**	**96.68**	**3.32**
Southern	20	Paktika	126086	2792	128878	97.83	2.17
	21	Zabul	80147	48640	128787	62.23	37.77
	22	Oruzgan	113754	0	113754	100.00	0.00
	23	Kandahar	271431	66110	337541	80.41	19.59
	24	Helmand	231219	16289	247508	93.42	6.58
	25	Nimroz	44255	0	44255	100.00	0.00
5		**Total**	**866892**	**133831**	**1000723**	**86.63**	**13.37**
North Western	26	Badghis	51464	503346	554810	9.28	90.72
	27	Herat	242794	139055	381849	63.58	36.42
	28	Farah	226903	1890	228793	99.17	0.83
	29	Ghor	120739	6705	127444	94.74	5.26
6		**Total**	**641900**	**650996**	**1292896**	**49.65**	**50.35**
		Grand total	**3175371**	**3080183**	**6255554**	**50.76**	**49.24**

Source = Afghanistan land cover and land use report by DAI, March 1993

Table 6. Mean yield (kg/ha) and rank of 10 varieties of barley tested in (96NBYT1) in 6 locations in Afghanistan during 1996-97 crop season.

No.	Name or Pedigree	Nangrahar		Kandahar		Balkh		Herat		Takhar		Ghazni		Overall mean	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1	GLORIA-BAR/COME-B//ORGE FICHEDRETT3270/...	2354	4	5022	4	4444	5	5478	3	6099	7	6692	1	5015	4
2	TROMPILLO-BAR	2583	2	5510	2	4442	6	4637	8	6531	2	6475	3	5030	3
3	LBIRAN/UNA80//LIGNEE-640/3/GLORIA-BAR...	2066	6	4407	6	3992	10	5466	4	6125	6	6642	2	4783	5
4	LBIRAN/UNA8271//GLORIA-BAR/COME-B/3/SEN	2419	3	5162	3	4933	1	5929	1	6478	3	5967	6	5148	2
5	CAMPILLO'LLERENA/DAPHNE//SEN	2256	5	4812	5	4260	7	4334	9	6450	4	4617	7	4455	7
6	GLORIA-BAR/COPAL//PM5/BEN/3/SEN	1736	10	3703	10	4583	3	4292	10	6288	5	5983	5	4420	9
7	SONATA	1998	7	4262	7	4065	8	4771	6	5839	9	0		4187	10
8	RIHANE 03	2737	1	5840	1	4842	2	5891	2	5300	10	6375	4	5164	1
9	YEA 389.3/YEA475.4	1922	9	4100	9	4467	4	4898	5	6828	1	0		4443	8
10	LOCAL CHECK	1995	8	4257	8	4019	9	4753	7	5844	8	6475	3	4557	6
	LSD AT 5 %	646		1378		642		860		1279					
	% C.V.	20.2		20.2		10.04		11.7		14.3					
	Nursery Mean	2206		4707		4405		5045		6178					

Maize (*Zea mays L.*)

Introduction

Maize is one of the most important cereal all over the world. Total areas covered in the world by maize is 129.8 million hectares (CIMMYT, 1990-1992). The World total production is 498,857,000 metric tons with an average of 3.8 Mt./ha. The areas covered by maize in Afghanistan reported 482000 hectares with total production of 780,000 MT in 1978/79 and 458000 hectares with total production of 587,000 Mt. in 1989/90, which shows the average yield of 1.6 to 1.2 Mt./ha. respectively (UNOCHA 1993).

Maize is grown in Afghanistan for grain and forage production. The yield of maize in developed countries rapidly increased from 5 tons to almost 15 tons/ha. (grain yield) by using the hybrid seeds with advanced management practices. Under research and control conditions in Afghanistan the yield of maize was reported from 5-7 tons/ha.

Maize hybrid seed production is not practiced in Afghanistan, because hybrid seed production is expensive and also yearly replacement of seed is very difficult. Therefore the best varieties under Afghan conditions are open pollinating and synthetic varieties.

The old synthetic varieties released in Afghanistan were Synthetic-1 Synthetic-2 and Synthetic 551. Local varieties were also grown in each zone. The synthetic varieties were higher yielding than local, but due to genetic contamination and disease (smut) they lost their yield potential gradually and are replaced by new varieties recently introduced to Afghanistan.

Many varieties has been introduced through FAO and international NGOs as an emergency in Agriculture rehabilitation program. In total, 33 varieties of maize have been studied in maize growing areas of the country. These varieties were procured and supplied through FAO from Pakistan, India and CIMMYT, Mexico.

Environmental Conditions: Maize can grow between 58° N - 35° South all over the world. The suitable temperature for growing maize is 21-27° C. Afghanistan has a diverse climate and there is a need to grow different maturity group of maize. Maize is more sensitive to frost and hence temperature should not drop below 10 ° C. Also it should mature before the first frost in fall, which occurs in mid September in cool areas. Maize varieties can be developed for two broad ecological zones according to their adaptation and planting time. Eastern provinces like Nangrahar, Laghman, Kunar, in south, Khost, in south west Kandahar and Helmand, are warm areas and the optimum time of planting is 25 June-22 July and harvesting time is 23 September-22 October. In cooler areas, the optimum planting time is 15 April-21 May and harvesting time is September. Cutworm is a problem especially at higher elevations and for this reason the farmers are using high seed rates at planting.

Materials and Methods

The trials were conducted in Randomized Complete Block Design (RCBD) with 4 replications. The distance between rows was 75 cm and between plants was 20 cm. The depth of seeding was 5-6 cm. The plot size was 6 rows; 5 meters long. Four central rows with 4 meters length were harvested for yield determination, 0.5 meter was cut from both ends to avoid border effects. Other cultural practices were applied uniformly on trials and the farmers test plots. Herbicides and other agro-chemical were not used for pest control. Statistical analysis of variance was computed for each trial and across years in multilocations testing and mean yield kg/plot were

changed to kg/ha. The yield results of the means for years and locations for each variety are reported in tables 1 to 4 for warm (low elevations) and cold (high elevations) areas of Afghanistan.

Results and Discussion

Table 5 shows the major maize growing areas of Afghanistan. The maize growing areas can be divided into lower and higher elevation zones.

High Elevation Maize Growing Areas: High elevation areas include Ghazni, Wardak, Logar, Gardez, Kabul, Kapisa and Parwan provinces. These provinces have cold winter with snow cover. Early maturing synthetics and composites are needed for these areas. The lowest, highest and average mean elevations of highland and lowland are presented in Table 5 (Annex 4).

The mean and overall mean yield of varieties and their ranking in Logar, Kapisa and Parwan provinces during 1990-1992 are given in Table 1 (Annex 4). Rank A is obtained from 3 years of multilocation tests.

Results in Table 1 show that variety EVII gave mean yield of 6112 kg/ha. ranked first in group A which has been tested for 3 years in 3 provinces in multilocations, while local variety yielded 2885 kg/ha. and ranked 11 th. It showed that variety EV-II gave 111% more yield than the local cultivar.

The second high yielding variety in the high elevation zone was Shaheen which yielded 5893 kg/ha. It produced 104% more yield than the local variety. Also Sarhad Yellow, Ehsan and Sarhad White with mean yields of 5876, 5533 and 5084 kg/ha respectively, ranked 3rd, 4th and 5th, and has given 103%, 92%, and 76% higher yield than the local variety.

Low Elevation Maize Growing Areas: Low elevation areas are Nangrahar, Laghman, Kunar, Kandahar, Helmand, Khost, Kunduz, Baghlan, Takhar and Balkh provinces. Maize can grow well in these areas without risk of frost killing. Maize-wheat is a predominant rotation in these provinces. Farmers must get enough time for land preparation and timely sowing of wheat crop after maize harvest in this zone. For this reason short duration maize varieties are always preferred.

The mean and overall mean yield in kg/ha of varieties and their ranking in Nangrahar, Laghman, Kunar, Helmand and Khost provinces during 1990-1994 in multilocations are shown in Table 2 (Annex 4). It revealed that variety Azam ranked first with yield of 6135 kg/ha. while Sarhad Yellow, Sarhad White and Sultan with mean yields of 5607, 4925 and 4800 kg/ha. ranked 2,3, and 4th respectively. The yield of local variety was 4165 kg/ha. In 4 years of multilocations testing in lower elevations, data show that variety Azam yielded 47%, Sarhad Yellow 35%, Sarhad White 18% and Sultan 15% more than the local variety.

Table 3 (Annex 4) shows mean yields and overall means in kg/ha., number of locations and ranks of varieties tested in both higher and lower elevations of Afghanistan during 1990-1994. It shows in rank A that variety Kissan with mean yield of 6313 kg/ha, Sarhad Yellow with mean yield of 5802 kg/ha, Azam with mean yield of 5468 kg/ha and POP-31 with mean yield of 5088 kg/ha in contrast to local the variety (3819 kg/ha) has given 65%, 51%, 43% and 33% higher yield.

Afghanaid NGO in 1989 tested 6 improved varieties of maize namely EV 4085 (Kissan), EV II, Shaheen, EV I, Azam, Ehsan and a local variety in Achin district of Kunduz province. The trial was planted on 6 July and harvested on 20 October 1989. The variety EV 4085, EV II, Ehsan matured in 97 days. The variety EVI matured in 102 days, Shaheen in 94 days, while the local

variety in 100 days. All varieties had more than 2 meters height. The highest yield (6545 kg/ha) was produced by Shaheen. EV 4085 (6300 kg/ha), Azam and EV I (5250 kg/ha), EV II (5215 kg/ha), and Ehsan (4690 kg/ha). The local variety yielded 4060 kg/ha. In contrast with local variety they produced 61%, 55%, 29%, 28% and 16% more yield.

Table 4 (Annex 4) shows the mean grain yield of maize varieties distributed by FAO in lower elevation such as Nangrahar, Kunar, Laghman and Khost provinces of Afghanistan to different NGOs for testing on farmers fields. Comparing the overall means variety Sunehri in one location gave the highest yield of 5250 kg/ha. Sarhad in 14 locations, yielded 4677 kg/ha, and Pop-845 in 6 locations yielded (4450 kg/ha) and ranked first, second and 3rd, respectively.

Conclusion and Recommendations

The following conclusions are drawn from trials and observations:

1. EV-II and Shaheen are good varieties for higher elevations such as Ghazni, Wardak, Logar, Kapisa, Parwan and Kabul.
2. Azam is good for lower elevations such as Nangrahar, Laghman, Kunar, Khost, Helmand and Kandahar.
3. Varieties Sarhad Yellow, Sarhad White and Kissan showed wide range of adaptation in both lower and higher elevations.
4. It is necessary to procure the original seed (pure) of these top yielding varieties of maize and follow recurrent selection program in future with good seed production and isolation.
5. Short duration maize varieties, with high yield potential and resistant to smut are needed in Afghanistan to fit into double cropping pattern, or in areas having extremely short growing season particularly in the higher altitudes.
6. Farmers are broadcasting and over planting maize seed for a variety of reasons. It is recommended in higher altitude to thin the crop 3 weeks after planting for getting optimum yield.
7. Farmers must be encouraged to plant maize in row planting. Intercropping and improved cultural practices trials should be considered in future maize program.
8. Farmers must be encouraged to plant improved varieties of maize during May/June, wherever possible at all altitudes in order to get satisfactory yield.

Information on recommended maize varieties tested for 3-4 years in multilocations in low and high elevation zones in Afghanistan

1. **SHAHEEN:** is the earliest-maturing white-grain variety. Developed from a cross between 'Zia' and the very early-maturing varieties 'Nodak' and 'Mandan' from the USA, and Payette' from Canada. Because of its special characteristics of cold tolerance in addition to early maturity, it is being cultivated in the high-elevation zones of NWFP and Afghanistan, where the growing seasons are short. It was released in 1974 and is recommended for cultivation at high elevation in the mountains. It is susceptible to leaf blights and rust. Its yield is about 4000 kg/ha.
2. **AZAM:** White, semi-flint, mid-season variety, maturing in about 90 days. Developed from the cross ('Pirsabak 7930'x Zia) x 'Pirsabak 9730', it is of medium height with

good resistance to lodging. Moderate resistance to leaf blights. Grains are bold and pearly white. Yield 5000-5500 kg/ha. Released in 1983. Considerably improved through half-sib family selection for disease resistance, uniformity, and plant type. It is a very good variety for the irrigated plains and is moderately drought tolerant.

3. **KISSAN 90:** Another good, short to medium-duration, white-grain variety recommended for irrigated as well as good rainfed areas. Derived from a cross between a well-known experimental variety, 'Pirsabak 7930', and a leading local germplasm, using a full-sib family selection scheme. Has short plant type, with low ear placement, and can tolerate high plant densities. Matures in about 85 days and can be grown late in some parts of NWFP, after Virginia tobacco is harvested. Moderately resistant to Helminthosporium maydis. Yield potential higher than that of 'Azam'. Approved for general cultivation in 1990. Also planted in the lowlands of Afghanistan.
4. **SARHAD YELLOW:** Full-season (110-115 days), yellow-grain variety, developed from a cross between 'Vikram' x ('B57' x 'B37') x 'Akbar'. Height 2.3-2.5 m. Plant type resembles US temperate germplasm. Ears long, kernels dent-flint, arranged in 14-18 rows on the ear. Released in 1971. An excellent yellow variety in the full-season group. Also popular in the low-land, warmer areas of Afghanistan. It yields about 7000-8000 kg/ha. 'Sarhad Yellow' is moderately resistant to leaf blights.
5. **SARHAD WHITE:** White version of 'Sarhad Yellow'. White grains were selected from 'Sarhad Yellow', increased and tested for yield adaptation and maturity. Sarhad White is comparable to 'Sarhad Yellow' in yield, maturity, and adaptation, but is susceptible to leaf blights. Released for general cultivation in 1974.
6. **EHSAN:** Mid-season, white flint variety. Developed from the cross between 'Sarhad White' and lot 81 of CIMMYT material. Matures in 100 days. An outstanding variety in this maturity group. Ears of medium size, compact with 14-16 kernel rows. Even after the ears are harvested, the plant stays green and its stalks remain sweet. It has much better resistance to stalk rots and leaf blights than any other varieties. Its yield is about 7000 kg/ha.
7. **PAHARI (EV-II):** A short-duration variety bred specially for production in the cool mountain environment. Developed at Kaghan through half-sib family selection from the cross of 'Shaheen' x 'Pirsabak 7930', 'Pahari' has the earliness and cold tolerance of 'Shaheen' and the disease resistance of 'Pirsabak 7930' it was released in 1992 for mid-elevation zones from 1000-1800m above sea level. But it can also be recommended for late planting following Virginia tobacco. Its yield on mid elevations is about 5000-7000 kg/ha.
8. **SUNEHRI:** Midseason June/early July planting 110 days at low altitude and 120 days at mid altitude up to 1300 m.
9. **POPULATION-31:** Midseason June/early July planting 110 days at low altitude and 120 days at mid altitude up to 1300m.

Annex 4
Maize data 1991-1995
(Tables 1-5)

Table 1. Mean and overall mean yield (kg/ha) and rank of maize varieties tested in high elevation areas of Afghanistan during 1990-92.

No.	Name o	Locations			Years	Overall Mean	Rank		
		Logar	Kapisa	Parwan			A	B	C
1	Kissan	4000	3250		2B	3625		6	
2	Azam	3080	4008	6755	3A	4615	9		
3	Sarhed White	3921	4219	7111	3A	5084	5		
4	Sarhed Yellow	3894	4224	9511	3A	5876	3		
5	EV-II	3079	5481	9777	3A	6112	1		
6	Shaheen	4662	5463	7555	3A	5893	2		
7	NZ-S-1	4100			1C	4100			4
8	NZ-S-2	5400			1C	5400			2
9	EV-I	2204	3822	6222	3A	4083	10		
10	Pop-31								
11	EV-4085	2844	4888	6666	3A	4799	8		
12	Pop-845	4195	7933		2B	6064		1	
13	Arun II								
14	Sunehri	4300			1C	4300			3
15	Dehqan		3382		1C	3382			5
16	Hybrid-7877	7600	3767		2B	5984		2	
17	C-501	4600	5041		2B	4821		5	
18	Sultan	2800			1C	2800			6
19	N2-S-3	3475	7511		2B	5493		4	
20	Pop-45								
21	Ehsan	3178	4533	8888	3A	5533	4		
22	Bahar	3305	4444	7466	3A	4972	7		
23	PS-EV-6088	3306	6222	5600	3A	5043	6		
24	Ganish								
25	Poinear Amum			10666	1C	10666			1
26	Cargill 32848	2411				2411			
27	Kashmir Gold								
28	TL 8845								
29	DUC- Trong 8731								
30	Batan 8784 E	4613	7156		2B	5885		3	
31	Local	1019	3815	3822	3A	2885	11	7	
32	Across 87								
33	Batan								

Rank A = Group of varieties that have been tested 3 years in multilocations

Rank B = Varieties that have been tested 2 years in multilocations

Rank C = Varieties that have been tested 1 year " "

Table 2. Mean yield, overall mean (kg/ha) and rank of maize varieties tested in lower elevation in Afghanistan in 1990-1994.

No.	Name	Locations					Years	Overall mean	Rank	
		NGR	KNR	LGM	KST	HLM			A	B
1	Kissan	6159	6249	6466			3B	6292		3
2	Azam	4868	6239	9110	6328	4131	5A	6135	1	
3	Sarhad White	4101	4235	5473	6345	4469	5A	4925	3	
4	Sarhad Yellow	5851	6383	5721	6295	3785	5A	5607	2	
5	EV-II	2382	3511	3269	6544	3302	5A	3802	10	
6	Shaheen	2711	3581	2948	6435	3331	5A	3801	11	
7	NZ-S-1	3829	2663	2885			3B	3126		13
8	NZ-S-2	4166	2715	3561		4866	4A	3827	9	
9	EV-I	1605			6666		2B	4136		9
10	Pop-31	5521	5236	4406	2800		4A	4491	5	
11	EV-4085	3206		3815	5177	4860	4A	4265	6	
12	Pop-845	5787	3895	4178			3B	4620		6
13	Arun II	4790	4172	4608	4000		4A	3393	12	
14	Sunehri	2422			5250		2B	3836		10
15	Dehqan	2644	4312				2B	3478		11
16	Hybrid-7877		5212				1C	5212		
17	C-501		5500				1C	5500		
18	Sultan	4832	5368	4851		4150	4A	4800	4	
19	N2-S-3	4786	4906	2781		3590	4A	4016	8	
20	Pop-45	6301	3972	3847			3B	4707		5
21	Ehsan				5657	3335	2B	4496		7
22	Bahar				5057	3256	2B	4157		8
23	PS-EV-6088				6011	4056	2B	5034		4
24	Ganish	2838		3850	3000		3B	3229		12
25	Poinear Amum					4677	1C	4677		
26	Cargill 32848					4512	1C	4512		
27	Kashmir Gold					4837	1C	4837		
28	TI-8845	5883	6977	6943			3B	6601		2
29	DUC-Trong 8731	5854	7633	7167			3B	6885		1
30	Batan 8784E									
31	Local	3812	4713	6727	2920	2655	5A	4165	7	
32	Across 87									
33	Batan									

Mean of 4 replications from each province.

Rank A = Group of varieties tested for 4-5 years, B= tested for 2-3 years in different locations

NGR= Nangrahar, KNR= Kunar, LGM= Laghman, KST= Khost, HLM= Melmand

Table 3. Mean yield, overall mean (kg/ha), number of locations and rank of maize varieties tested in both high and low elevations in Afghanistan during 1990-1994.

No.	Name	90		91		92		93		94		1990-94		Ranks		
		Loc	Mean	Loc	Mean	Loc	Mean	Loc	Mean	Loc	Mean	No.Loc.	Mean	A	B	C
1	Kissan	1	8000	4	4201	32	7185	3	5864			40A	6313	1		3
2	Azam	5	4921	4	3647	3	7837					12A	5468	3		9
3	Sarhad White	5	5140	4	3935	3	5413	3	4188			15A	4669	6		20
4	Sarhad Yellow	5	5443	4	4573	29	7887	3	6430	14	4677	55A	5802	2		6
5	EV-II	5	5587	3	3149	29	5006			15	2958	52A	4175	11		25
6	Shaheen	5	5720	4	3747	5	4784			27	3657	41A	4477	8		21
7	NZ-S-1			2	3272							2 B	3272		19	31
8	NZ-S-2			2	3497					6	3076	8 B	3287		18	30
9	EV-I	5	4756							1	1605	6 B	3181		20	32
10	Pop-31					29	6100	3	5996	6	3167	38A	5088	4		12
11	EV-4085	5	4887							10	3510	15B	4199		14	23
12	Pop-845					29	5282	3	4344	6	4450	38A	4692	5		19
13	Arun II					15	5100	6	4819	11	3905	32A	4608	7		21
14	Sunehri					10	5500			1	5250	11B	5375		7	10
15	Dehqan	1	8270	3	3445							4B	5858		4	4
16	Hybrid 7877			2	5526							2B	5526		6	8
17	C 501			3	5047							3B	5047		9	13
18	Sultan	1	4150	2	2594			3	5833			6A	4192	10		24
19	N2 S 3	2	3319			2	4844	3	4879			7A	4347	9		22
20	Pop- 45					44	5100	3	4706			47B	4903		11	15
31	Ehsan	5	5118									5B	5118		8	11
22	Bahar	5	4706									5B	4706		13	17
23	PS EV 6088	5	5039									5B	5039		10	14
24	Ganish									12	3172	12B	3172		21	33
25	Poineer Amum	5	5687									5B	5687		5	7
26	Cargill 32848	2	3462									2B	3462		17	29
27	Kashmir Gold	1	4837									1B	4837		12	16
28	TL 8845					3	6601					3B	6601		2	2
29	Duc Trong 8731					3	6884					3B	6884		1	1
30	Batan 8784 E					2	5884					2B	5884		3	5
31	Local	6	3323	4	2834	60	5082	3	4038			73A	3819	12		27
32	Across 87					12	3900					12B	3900		15	26
33	Batan					12	3500					12B	3500		16	28

Means of 4 replications in each year, Rank A = Group of varieties tested 3-5 year, B= 1-2 years, C= 1-5 years

Table 4. Mean Yield (kg/ha)of different maize varieties on farmrs field in Nangarhar, Kunar, Laghn provinces of Afghanistan which were distributed by FAO in 1994.

		Nangarhar			Kunar			Laghman			Khost			Total	Overall	
No.	Variety	L	yield	R	L	yield	R	L	yield	R	L	yield	R	L	mean	R
1	Pop- 31	4	2786	6				1	4285	4	1	2800	6	6	3167	8
2	Sarhad	8	3093	3				5	4417	3	1	5600	1	14	4677	2
3	NZS2	2	3332	1				4	2820	9				6	3076	9
4	Arun-II	8	2721	7				1	4900	2	2	4000	4	11	3905	4
5	Shaheen	17	3078	4	5	3320	1	4	2948	8	1	4200	3	27	3657	5
6	EV-I	1	1605	9										1	1605	11
7	EV-II	5	2345	8	5	3260	3	5	3269	7				15	2958	10
8	Ganish	10	2838	5				1	3850	5	1	3000	5	12	3172	7
9	EV-4085	5	3206	2				5	3815	6				10	3510	6
10	Pop-845				5	3300	2	1	5600	1				6	4450	3
11	Sunehri				5						1	5250	2	1	5250	1

R= Rank, L.= Number of locations

Wheat (*Triticum aestivum L.*)

Introduction

Afghanistan is an agricultural country where 85% of the people are engaged in agriculture related activities. The agro-climatic conditions of the country are suitable for the production of fruits, vegetables, oil, industrial, leguminous and cereal crops. Cereal crops are grown on about 87% of all cultivated land with wheat as the principal crop occupying 57% of the land under cereal production (Table 1). Wheat bread is the major item in the daily diet of the people. The per capita consumption of wheat is 180 kg/year which is among the highest in the world (CIMMYT 1995).

In 1968 an accelerated wheat varieties introduction and release program was undertaken in the country as a result of which many new and improved varieties of wheat were distributed to the farmers. In addition to this, the establishment of research program, distribution of inputs (DAP, Urea fertilizer and agricultural credit), and good extension services contributed to increase in yield of wheat from 832 kg/ha in 1964 to 1,311 kg/ha in 1978.

Consequently import of wheat stopped and the country became almost self-sufficient in food. Unfortunately, this did not last long and as a direct result of the war, agricultural production in 1987 was reported to have fallen to 45-53% of 1978 level (SCA, First Report 1988). Farm labor, family labor and farm power have reduced 20% and 40% respectively. Use of urea fertilizer declined from 76% to 53% and use of DAP fertilizer declined from 57% to 33%. Many farmers left the country and migrated to Pakistan and Iran. The destruction of irrigation infrastructure resulted in a decrease in irrigation water and consequently reduction in yield of major food crops. The drop in total cultivated area (irrigated and rainfed), per capita food production and cereal crops for different years has been noticed (Tables 2 and 3).

The activities in agricultural research, extension, credits for agricultural inputs, seed multiplication and plant protection stopped. The varieties which were introduced to the farmers became susceptible to disease and severe yield reduction had been observed. Some farmers were unable to get even the seed they have planted. The shortage of agricultural inputs and their high prices are deterring farmers from using them. The only urea fertilizer factory in Mazar-i-Sharif with a capacity of 380 Mt./day is producing only 80 Mt./day due to lack of spare parts and no maintenance.

Fortunately, under the directives of FAO, some international NGOs, such SCA (Swedish Committee for Afghanistan), DACAAR (Danish Committee for Aid for Afghan Refugee), Afghanaid, IRC (International Rescue Committee), CoAR (Coordination of Afghan Relief), and MADERA (Mission d'Aid au Development des Economies Rurales en Afghanistan) were conducting agricultural research trial on cereal crops. As a result new wheat varieties such as Atay-85, Pirsabak-85, PAK-81 and Inqilab-91 were introduced to different parts of the country and these varieties have been transported by FAO to implementing partner NGOs from Pakistan. In the mean time the multiplication of these varieties was initiated inside Afghanistan. In 1993 a new race of stripe rust came to Afghanistan from the neighboring countries and the varieties Pirsabak-85 and Pak-81 have shown susceptible response to this new race of stripe rust. Three new wheat varieties such as Ariana-94, Speenghar-94 and Pamir-94 were released to farmers. Two of these (Ariana-94 and Speenghar-94) did not have the desirable resistance to the new race of stripe rust, but fortunately Pamir-94 is resistant.



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By

N.Wassimi

Senior Technical Adviser (Crop Improvement)

(UNO/AFG/001/DPS)

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By

N. Wassimi
Senior Technical Adviser (Crop Improvement)
(UNO/AFG/001/DPS)

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